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27 February 1989

Ms. Janet Feldstein
U.S. Environmental Protection Agency
Region II
Emergency and Remedial Response Division
Room 737
26 Federal Plaza
New York, New York 10278

FILE: 802-01-11-01

Dear Janet:

Enclosed for your review is the Scope of Treatability Studies for the Feasibility Study/First Operable Unit (FS/FOU) for the Scientific Chemical Processing (SCP) site in Carlstadt, New Jersey. Four additional copies are included for your use. The Scope of Treatability Studies dated 24 February 1989, supercedes the Scope of Treatability Studies dated 3 January 1989.

If you have any questions/comments, please contact Mr. Gil Weil at (201) 563-5905, or me at (215) 524-3521. Thank you.

Sincerely,

Marian E. Donovan Carlin

Marian E. Donovan Carlin
Project Manager

MEDC/jkp

Enclosures

cc: Pam Lange (3 enclosed)
Harry Yeh (2 enclosed)
Gil Weil (enclosed)
Ron Fender (enclosed)
Bill Warren
Susan Hoffman (enclosed)
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SCOPE OF TREATABILITY STUDIES
FEASIBILITY STUDY/FIRST OPERABLE UNIT
SCP/CARLSTADT

24 February 1989

Marian E Donovan Carlin for Ron G. Fender
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SECTION 1

SUMMARY OF SCOPE

The Scope of Treatability Studies for the FS/FOU describes work to be conducted in order to evaluate remediation processes for the soils/sludges at the site via solidification/stabilization processes, extraction, and thermal treatment, and for the ground water at the site via steam stripping, critical-fluid extraction, UV/peroxidation, and granular activated carbon.

SECTION 2

SOLIDIFICATION/STABILIZATION

2.1 Introduction

A portion of the Treatability Study will focus on the feasibility of solidifying or stabilizing surface soils located above the clay strata, and sludges from both the former pit area above the clay strata and the tank, at the SCP/Carlstadt site. The following scope of work describes the processes to be evaluated, treatability study objectives and procedures, and the basis for selecting soil/sludge samples and stabilization agents for treatability. This study is intended to collect preliminary information on design mixes for the solidification/stabilization process for the site.

2.2 Process Description

Solidification and stabilization processes can be very similar and often the terms are used interchangeably. In this report, the term solidification refers to the conversion of soil and sludges to a solid in which contaminants are physically immobilized, while stabilization is used to indicate processes in which contaminants are both physically and chemically immobilized. Physical immobilization consists of encapsulating contaminants inside a highly impermeable, solid matrix. There are two basic types of processes that will be evaluated in this treatability study: cementitious and pozzolanic. The cementitious process involves the mixing of alkaline material with soil or sludges

(i.e., wastes), so that the waste becomes immobilized into a cement-like material. Alkaline materials are often referred to as "reaction initiators." Reaction initiators that can be used in the cementitious process include slaked lime, high calcium (or dolomitic) lime, hydrated lime, portland cement, quicklime, cement kiln dust, lime kiln dust, and carbide limes. The cementitious process chemistry is similar to that for commercial cement production.

The pozzolanic process is the mixing of finely-divided alumina and silica-based materials (i.e., "pozzolans") and alkaline earth materials with waste, so that the waste becomes immobilized in a dense crystalline matrix. Pozzolans that can be used include cement kiln dust (which is also an alkaline reaction initiator), blast furnace slags, fly ash, and electric furnace dusts. Types of fly ash include bituminous, subbituminous, and lignite ashes. The pozzolans and reaction initiators are known as process "additives." The pozzolanic process chemistry includes three classes of chemical reactions:

1. Soluble silicates in the additives react with cations in the waste, thus forming insoluble silicates;

2. Silicate setting agents in the additives react with the remaining soluble silicates to produce a gel-like structure; and

3. Hydrolysis, hydration, and neutralization reactions occur to convert the gel-like structure to a solidified (or stabilized) mass.

Solidification or stabilization of soils and sludges can be implemented by either in situ or ex-situ methods. In situ methods process the soils and sludges in place, without excavation. Ex-situ methods require initial excavation of the

soils and sludges, and mixing of additives with the excavated material in an above-ground system followed by replacement on site. Both in situ and ex-situ methods will be evaluated. The treatability study will also evaluate the effect of solidifying or stabilizing the soils and sludges in the presence of ground water and rubble. The treatability study is described in detail below.

2.3 Objectives

The objective of this treatability study is to evaluate the effectiveness of these technologies for reducing the toxicity or mobility of contaminants in site soils and sludges. Treatability tests on actual wastes from the SCP/Carlstadt site will be conducted because the performance of these technologies is waste-specific. Additives to be utilized in these initial tests were selected on the basis of the following information:

1. Chemical and physical properties of the soils and sludges and their associated contamination;

2. Solidification/stabilization case histories; and

3. Technical literature.

Specific objectives of the treatability tests include the following:

1. To determine the applicability of the solidification/ stabilization process to site soil and sludges;

2. To determine the effectiveness of the process for remediation of site soil and sludges, in terms of meeting certain strength, permeability, and leachate criteria;

3. To evaluate potential chemical process conditions; and

4. To provide a preliminary estimate for the unit costs.

2.4 Treatability Study Procedures

The following procedures are designed to evaluate a range of processes and simulate the actual chemical reactions that could take place. These procedures cover raw sample characterization, process trials, process sample analyses, test data collection and evaluation, and reporting of test results.

Treatability testing will be performed by using bench-scale techniques performed in a subcontractor laboratory. During the tests, waste samples will be processed and evaluated for performance data that will enable the evaluation of source-control technologies.

2.4.1 Soil and Sludge Samples for Testing

Soil and sludge samples have been selected to be representative of the conditions at the SCP/Carlstadt site. All site sampling and sample compositing will be performed in accordance with the Sampling Plan dated 24 January 1989. Three 5-gallon containers of each of the following samples will be received by both subcontractors:

1. Soil sample labeled "Soil Hot Spot - Lead,"

2. Soil sample labeled "Soil Hot Spot - VOCs,"

3. Soil sample labeled "Hot Spot Soil Composite - All Parameters",

4. Soil sample labeled "Overall Soil Composite,"

5. Sludge sample labeled, "Sludge Hot Spot - B/N," and

6. Sludge sample labeled "Sludge Tank and Pit Composite."

Details about the above sample types are provided in the Sampling Plan dated 24 January 1989. Volatilization during mixing will be minimized by limiting handling of the samples into the containers, and mixing conducted only at the contractors' facilities. Sample sizes are approximately twice that required by the contractors, to allow adequate sample volume for additional testing, if necessary.

2.4.2 Raw Sample Characterization

Following mixing, a portion of each sample type received by both contractors will be shipped to CompuChem Laboratory for characterization. The sample characterization will serve as a baseline for comparison with processed sample characteristics and for determining process performance. Tables 2-1 and 2-2 provide information concerning the analyses and laboratory.

2.4.3 Process Trials

The soil and sludge samples will be subjected to process trials to evaluate the feasibility of cementitious, pozzolanic, or proprietary chemical solidification/stabilization processes. Process trials will be defined as mixing a known weight or volume of raw sample with a known weight of one or more process additives, and allowing chemical reactions in the resulting mixture (or "plug") for a specified length of time (i.e., "curing time"). The weights or volumes of raw samples and the weights of additives are to be determined by the subcontractors. The process trials will follow these guidelines:

TABLE 2-1

ENRECO LABORATORIES, Inc.
STABILIZATION/SOLIDIFICATION TREATABILITY STUDY

SAMPLE TYPE	SAMPLING LOCATIONS
Soil Hot Spot-Lead	P - 3
Soil Hot Spot-VOCs	B - 3
Hot Spot Soil Composite	B-1, B-2, B-3, B-5, MW-3S
Overall Soil Composite	B-4, P-2, P-3, P-4, MW-6S
Sludge Hot Spot-B/N	B - 1
Sludge Tank and Pit Composite	Random Points: 4 from Tank and 4 from Former Pit

SAMPLE QUANTITY BREAKDOWN

TREATABILITY ROUND	SAMPLE TYPE	ANALYSES	NUMBER OF DESIGN MIX PLUGS TO BE TESTED
INITIAL RECEIPT	Soil Hot Spot-Lead	Moisture Content; Lead Analysis	
	Soil Hot Spot-VOCs	Moisture Content; VOCs Analysis	
	Hot Spot Soil Composite	Moisture Content;Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86	
	Overall Soil Composite	Moisture Content;Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86	
	Sludge Hot Spot-B/N	Moisture Content; B/N	
	Sludge Tank and Pit Composite	Moisture Content; TCL Metals and PCBs	
ROUND I	Soil Hot Spot-Lead Soil Hot Spot-VOCs Hot Spot Soil Composite Overall Soil Composite Sludge Hot Spot-B/N Sludge Tank and Pit Composite	24- Hour Visual Analysis by ENRECO	72 Total (6 Samples;4 Conventional Additives/Sample; 3 Design Mixes/Sample)

TREATABILITY ROUND	SAMPLE TYPE	ANALYSES	NUMBER OF DESIGN MIX PLUGS TO BE TESTED
ROUND 2	Soil Hot Spot-Lead Soil Hot Spot-VOCs Hot Spot Soil Composite Overall Soil Composite Sludge Hot Spot-B/N Sludge Tank and Pit Composite	ASTM Unconfined Compressive Strength Tests (UCS) @3, 7, 14 day curing	36 Total (6 Samples; 2 Design Mixes/Sample; for 3, 7, 14 day cured plugs)
ROUND 3 (Begins after 3- and 7-day UCS analysis in Round 2)	Soil Hot Spot-Lead Soil Hot Spot-VOCs Hot Spot Soil Composite Overall Soil Composite Sludge Hot Spot-B/N Sludge Tank and Pit Composite	ASTM Unconfined Compressive Strength Tests (UCS) @3, 7, 14 day curing	36 Total (6 Samples; 2 Design Mixes/Sample; for 3-, 7-, 14 -day cured plugs)
	Hot Spot Soil Composite adding ground water if moisture level is below optimum, or run as is if the moisture level is above optimum	TCLP Leachate Development, with Complete Analysis of Proposed Toxicity Characteristic Contaminants FR 21648, 6/13/86 on a 3-day cured plug	1 (Best design mix for sample type as demonstrated by UCS Testing results for 3- and 7-day cured plugs)*
	Soil Hot Spot-Lead Soil Hot Spot-VOCs Hot Spot Soil Composite Overall Soil Composite Sludge Hot Spot-B/N Sludge Tank and Pit Composite	(SW-846, Method 9100) Triaxial Permeability Testing on a 14-day cured plug	6 Total* (Replicates made at beginning of Round 3)

*Based on the UCS test results; the better of the two design mixes will be used for these tests.

TREATABILITY ROUND	SAMPLE TYPE	ANALYSES	NUMBER OF DESIGN MIX PLUGS TO BE TESTED
ROUND 3 Con't	Soil Hot Spot-Lead	TCLP on 14-day cured plug, Lead Analysis	1* (Replicate made at beginning of Round 3)
	Soil Hot Spot-VOCs	TCLP on 14-day cured plug, Partial Analysis of Proposed Toxicity Characteristic Cotaminants (VOCs only) FR 21648, 6/13/86	1* (Replicate made at beginning of Round 3)
	Hot Spot Soil Composite	TCLP on 3-day cured plug, Complete Analysis of Proposed Toxicity Characteristic Cotaminants FR 21648, 6/13/86	2* (Replicates made at beginning of Round 3)
		TCLP on 14-day cured plug, Complete Analysis of Proposed Toxicity Characteristic Cotaminants FR 21648, 6/13/86	
	Overall Soil Composite	TCLP on 14-day cured plug, Complete Analysis of Proposed Toxicity Characteristic Cotaminants FR 21648, 6/13/86	1* (Replicate made at beginning of Round 3)
	Sludge Hot Spot-B/N	TCLP on 14-day cured plug, B/N Analysis	1* (Replicate made at beginning of Round 3)
	Sludge Tank and Pit Composite	TCLP on 14-day cured plug, Metals and PCBs Analysis	1* (Replicate made at beginning of Round 3)
	Hot Spot Soil Composite	Multiple Extraction Procedure on a 14-day cured plug, Complete Analysis of Proposed Toxicity Characteristic Cotaminants FR 21648, 6/13/86	1* (Replicate made at beginning of Round 3)

*Based on the UCS test results, the better of the two design mixes will be used for these tests.

TABLE 2-2

HAZCON, INC
STABILIZATION/SOLIDIFICATION TREATABILITY STUDY

SAMPLE TYPE	SAMPLING LOCATIONS
Soil Hot Spot-Lead	P - 3
Soil Hot Spot-VOCs	B - 3
Hot Spot Soil Composite	B-1, B-2, B-3, B-5, MW-3S
Overall Soil Composite	B-4, P-2, P-3, P-4, MW-6S
Sludge Hot Spot-B/N	B - 1
Sludge Tank and Pit Composite	Random Points: 4 from Tank and 4 from Former Pit

SAMPLE QUANTITY BREAKDOWN

TREATABILITY ROUND	SAMPLE TYPE	ANALYSES	NUMBER OF DESIGN MIX PLUGS TO BE TESTED
INITIAL RECEIPT	Soil Hot Spot-Lead	Moisture Content; Lead Analysis	
	Soil Hot Spot-VOCs	Moisture Content; VOCs Analysis	
	Hot Spot Soil Composite	Moisture Content;Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86	
	Overall Soil Composite	Moisture Content;Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86	
	Sludge Hot Spot-B/N	Moisture Content; B/N	
	Sludge Tank and Pit Composite	Moisture Content; TCL Metals and PCBs	
ROUND I	Soil Hot Spot-Lead Soil Hot Spot-VOCs Hot Spot Soil Composite Overall Soil Composite Sludge Hot Spot-B/N Sludge Tank and Pit Composite	24- Hour Visual Analysis by ENRECO	72 Total (6 Samples;2 Conventional Additives/Sample; 2 Proprietary Additives/Sample; 3 Design Mixes/Sample)

TREATABILITY ROUND	SAMPLE TYPE	ANALYSES	NUMBER OF DESIGN MIX PLUGS TO BE TESTED
ROUND 2	Soil Hot Spot-Lead Soil Hot Spot-VOCs Hot Spot Soil Composite Overall Soil Composite Sludge Hot Spot-B/N Sludge Tank and Pit Composite	ASTM Unconfined Compressive Strength Tests (UCS) @3, 7, 14 day curing	36 Total (6 Samples; 2 Design Mixes/Sample; for 3, 7, 14 day cured plugs)
ROUND 3 (Begins after 3- and 7-day UCS analysis in Round 2)	Soil Hot Spot-Lead Soil Hot Spot-VOCs Hot Spot Soil Composite Overall Soil Composite Sludge Hot Spot-B/N Sludge Tank and Pit Composite	ASTM Unconfined Compressive Strength Tests (UCS) @3, 7, 14 day curing	36 Total (6 Samples; 2 Design Mixes/Sample; for 3-, 7-, 14 -day cured plugs)
	Hot Spot Soil Composite adding ground water if moisture level is below optimum, or run as is if the moisture level is above optimum	TCLP Leachate Development, with Complete Analysis of Proposed Toxicity Characteristic Contaminants FR 21648, 6/13/86 on a 3-day cured plug	1 (Best design mix for sample type as demonstrated by UCS Testing results for 3- and 7-day cured plugs)*
	Soil Hot Spot-Lead Soil Hot Spot-VOCs Hot Spot Soil Composite Overall Soil Composite Sludge Hot Spot-B/N Sludge Tank and Pit Composite	(SW-846, Method 9100) Triaxial Permeability Testing on a 14-day cured plug	6 Total* (Replicates made at beginning of Round 3)

*Based on the UCS test results; the better of the two design mixes will be used for these tests.

TREATABILITY ROUND	SAMPLE TYPE	ANALYSES	NUMBER OF DESIGN MIX PLUGS TO BE TESTED
ROUND 3 Con't	Soil Hot Spot-Lead	TCLP on 14-day cured plug, Lead Analysis	1* (Replicate made at beginning of Round 3)
	Soil Hot Spot-VOCs	TCLP on 14-day cured plug, Partial Analysis of Proposed Toxicity Characteristic Cotaminants (VOCs only) FR 21648, 6/13/86	1* (Replicate made at beginning of Round 3)
	Hot Spot Soil Composite	TCLP on 3-day cured plug, Complete Analysis of Proposed Toxicity Characteristic Cotaminants FR 21648, 6/13/86	2* (Replicates made at beginning of Round 3)
		TCLP on 14-day cured plug, Complete Analysis of Proposed Toxicity Characteristic Cotaminants FR 21648, 6/13/86	
	Overall Soil Composite	TCLP on 14-day cured plug, Complete Analysis of Proposed Toxicity Characteristic Cotaminants FR 21648, 6/13/86	1* (Replicate made at beginning of Round 3)
	Sludge Hot Spot-B/N	TCLP on 14-day cured plug, B/N Analysis	1* (Replicate made at beginning of Round 3)
	Sludge Tank and Pit Composite	TCLP on 14-day cured plug, Metals and PCBs Analysis	1* (Replicate made at beginning of Round 3)
	Hot Spot Soil Composite	Multiple Extraction Procedure on a 14-day cured plug, Complete Analysis of Proposed Toxicity Characteristic Cotaminants FR 21648, 6/13/86	1* (Replicate made at beginning of Round 3)

*Based on the UCS test results, the better of the two design mixes will be used for these tests.

1) Pieces of rubble approximately 1/2" or less in size will remain in the raw samples to better simulate actual field conditions, pieces over 1/2" will be removed from the samples;

2) The subcontractor will determine the optimal soil and sludge moisture content for successful processing and will compare the moisture content to that of the sample types received for study. If sample types do not have sufficient moisture content, the moisture content will be adjusted by the addition of water. The study will address the inclusion of site ground water for processing of one site soil hot spot composite sample.

   Alternately, if samples have greater than the optimum moisture content, the samples will be brought to optimum by dewatering. In addition, if samples have greater than the optimum moisture content, the study will address as well the solidification of an "as is" sample of the hot spot soil composite; one at above optimum level.

3) Process additives to be evaluated will be selected with the individual subcontractor, and will include as a minimum, the following additive types:

   a) For the cementitious process: hydrated lime or lime kiln dust as reaction initiators (in different mix design trials).

   b) For the pozzolanic process: hydrated lime or lime kiln dust as reaction initiators (in different mix design trials), and cement kiln dust or fly ash as pozzolans (also in different trials).

Proprietary additives may also be used, contingent on prior notification. Proprietary additives will be authorized only if each of the following conditions is met:

1) The proprietary process has already been developed on a commercial scale by the subcontractor,

2) The subcontractor provides performance data that adequately demonstrate the success of the proprietary process for treatment of similar materials, and

3) The subcontractor provides confirmation that the additive is nonhazardous.

Process trials performed will represent a range of mix ratios (i.e. "additive ratios"). Each process trial will represent a single additive mixture at a single additive ratio for a single sample type (i.e., a single "design mix").

Round 1

Each subcontractor will develop an initial set of three design mixes for each type of additive alkaline material, pozzolan, or proprietary agent, as applicable. The mixes will be made in the laboratory via blending of sample and process additives.

Each subcontractor will visually evaluate the resulting process plugs after one day, for the presence of free liquids and for apparent structural stability. Only those design mixes that result in plugs with structural stability and the absence of free liquid, will be given further consideration.

Round 2

Based on the evaluations in Round 1, the subcontractor will select two design mixes for each sample for a second round of mixes (Round 2). For each design mix selected for Round 2, three samples will be prepared for subsequent unconfined compressive strength (UCS) testing at 3, 7, and 14 days of curing. Curing will consist of sealing the plug in a moisture-tight container to prevent drying (or the additional intake of moisture), and allowing the plug to stabilize in an environment controlled at 10 to 20° C.

For each UCS analysis, one of these two test methods will be used, depending on the material type:

Cohesive soil-like materials:	ASTM-2166,
Monolithic materials:	ASTM-1633.

The UCS performance test results will provide a plot of strength versus curing time for each design mix. These data plots will be evaluated as described later under "Test Data Evaluation" in this scope of work.

Each subcontractor will evaluate the Round 2 design mixes for visual characteristics and strength after 7 days of curing. Two design mixes per sample, that require a relatively lower additive ratio to achieve the selected performance criteria of 50 psi UCS, will be selected for further evaluation in a third round of mixes (Round 3). The selection of the 50 psi strength criteria was made for consistency with the strength gain requested by EPA in remediation projects at other sites.

Round 3

Based on the results of the Round 2 evaluations, contractors will refine design mixes in Round 3, and may develop additional design mixes using additives and additive ratios not evaluated in the first two rounds.

Modification of additive ratios for certain design mixes, are to focus on determining possible optimal design mix ratios for achieving the strength performance criteria for each soil type. Initially, five replicate plugs of each design mix will be prepared for each soil type. In the case of the hot spot composite, eight replicate plugs of each design mix will be prepared initially. Strength performance testing will consist of UCS testing on 3-, 7-, and 14-day cured plugs. Based on the results of this strength testing, the best design mix for each sample will be selected for further performance testing, consisting of triaxial permeability and extraction leachate analyses. These two analyses will be tested at 14-day curing times.

Each permeability analysis will be conducted via the triaxial permeability test procedure outlined by USEPA (SW-846, method 9100). The test should be run in a triaxial permeameter (i.e., a flex-wall permeameter). Because of the aggressive mixing during the stabilization process, the stabilized mass in the field and the laboratory plugs are expected to have identical permeability values for vertical and horizontal flows. Therefore, the permeability values obtained in this test will represent both vertical and horizontal permeabilities.

As noted above, extraction leachate tests will be run on the duplicate sample plugs of those samples that are selected for permeability testing. Permeability and leachate tests will be

conducted concurrently, due to the restrictive time frame for completing treatability and the length of time required for chemical analysis of leachates. For leachate analyses, the subcontractor will send plugs to the same independent laboratory that received and analyzed portions of the raw samples earlier. The subcontractors will evaluate the results of permeability and leachate quality, and make preliminary determinations of the additive types and design mixes for each soil and sludge sample type. Leachates will be developed via the Toxicity Characteristic Leaching Procedure (TCLP) promulgated by the EPA. A sixth replicate of the best "Hot Spot Soil Composite" design mix plug will undergo a Multiple Extraction Procedure (MEP) after 14 days of curing as well.

The contractor will determine the optimal soil and sludge moisture content for successful processing, and will compare moisture content to that of the sample types received for study. If sample types do not have sufficient moisture content, adjustments will be made using tap water.

In addition, one hot spot soil composite sample will be brought to optimal moisture levels using ground water from the site, rather than tap water, to investigate the affects of site ground water to the process. Alternatively, if moisture content is greater than that required, the sample will be solidified "as is". After the second UCS testing (7-day curing), the design mix for the hot spot soil composite sample with better strength performance will be remixed, according to these stated conditions. After curing for 3 days, the design mix plug will undergo leachate analysis.

Indicator constituents for chemical analysis of the leachates, selected in order to evaluate the reduction in chemical mobility by the solidification/stabilization process, are noted in Tables 2-1 and 2-2.

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Figure 2-1 presents a flow diagram showing the successive treatability rounds and sample plug analyses to be conducted.

2.5 Test Data Evaluation

The plots of unconfined compressive strength versus curing time, the triaxial permeability test results, and the extraction leachate data will be evaluated to allow the following determinations:

1) Feasibility of achieving acceptable strength, permeability, and leachability in the processed samples;

2) The relative curing rates of various design mixes that achieve acceptable strength, permeability and leachability; and

3) The design mixes capable of achieving acceptable strength, permeability and leachability after a reasonable length of curing and utilizing an economical additive ratio.

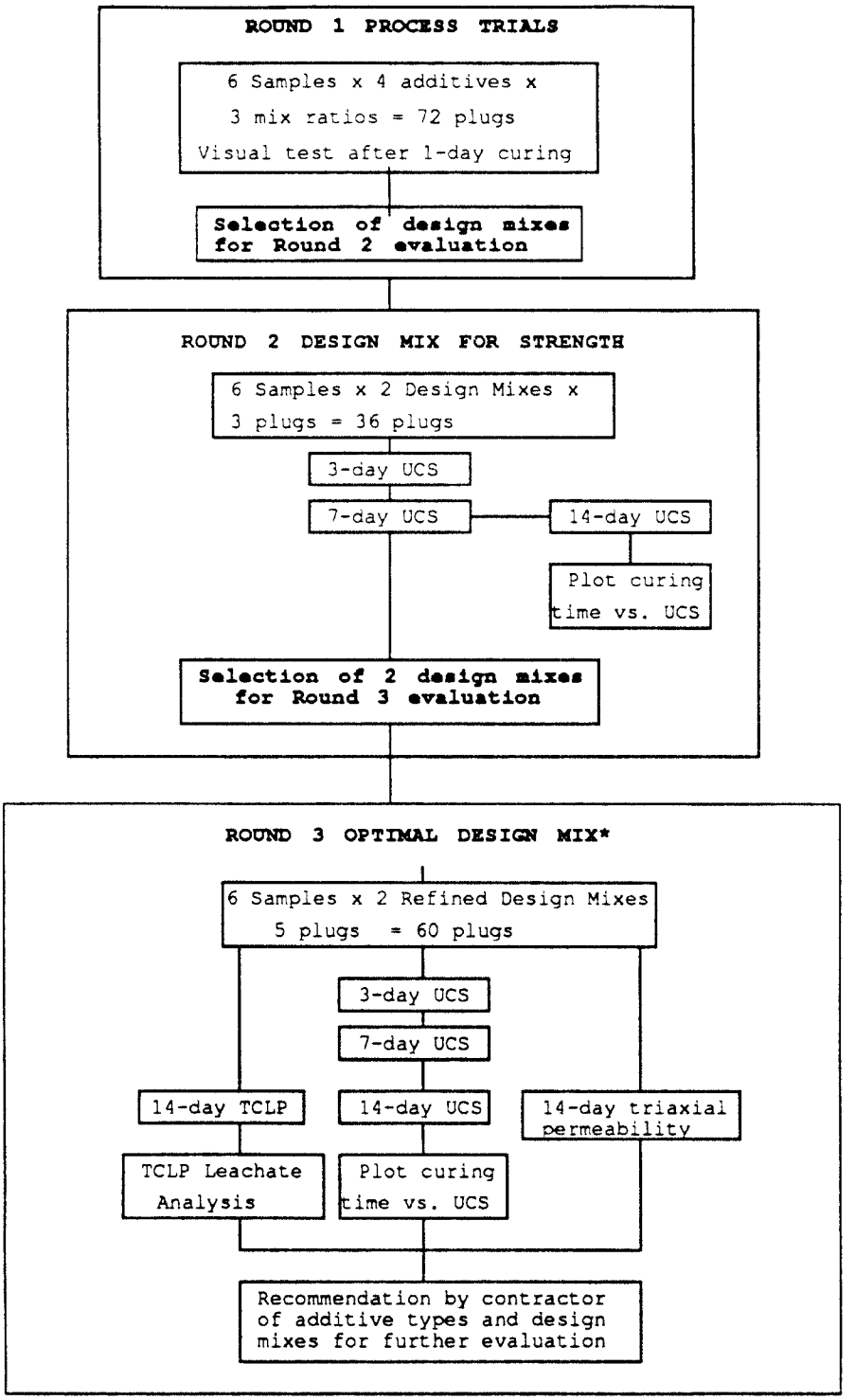
Performance data for the design mixes will be compared, and these mixes ranked according to their ability to address compressive strength, permeability and leachate testing.

2.6 Reporting of Test Results

Each subcontractor will provide a verbal report of the status and interim results of the treatability tests. Hard copies of data for specific design mix identifications will be sent by the

FIGURE 2-1

FLOW DIAGRAM FOR TREATABILITY WORK



*Refer to Tables 2-1 and 2-2 for extra testing for the Hot Spot Soil Composite Samples.

subcontractors. Each subcontractor will provide a brief treatability report containing the following information:

1) Summary of the procedures used to develop the test plugs.

2) Summary of all process performance data, including strength, permeability, and extraction leachate quality and all design mixes recommended for further evaluation.

3) Identification of the chemical process (i.e., pozzolanic, cementitious or other) used to develop each of the mix designs for which performance data are reported.

4) Identification of the preferred additive ratio to achieve the performance goal, including any necessary water removal or addition, along with an estimated additive ratio for full-scale processing of the waste, as projected on the basis of known waste characteristics.

5) A concise evaluation of process implementability to accommodate the characteristics of the site and waste.

6) Discussion concerning volatilization/exothermic reactions encountered during the tests, and methods to control potential emissions of dust and volatile organics during the process, which may include exothermic reactions.

7) Recommendations for further solidification/ stabilization testing.

SECTION 3

THERMAL TREATMENT

3.1 Introduction

This Treatability Study will focus on the fate of PCBs and metals during thermal treatment of First Operable Unit surface soils and the tank sludge. The following scope of work presents the treatability study purpose, objectives, samples to be used and procedures to be followed. This study is not intended to optimize the thermal treatment process for the site, or result in a process design.

3.2 Objectives

One objective of a thermal treatability study is to provide information to evaluate the fate of metals during thermal destruction of the soils and sludges. This involves characterization of the type, concentration, and leachability of metals which may be present in the ash after thermal treatment. Meeting this objective will help determine if the ash would require further treatment prior to disposal. A second objective is to confirm if 99.9999 percent destruction of PCBs is achievable under conditions that do not present a particulate and metals control problem. Specific objectives of thermal treatability study include the following:

- To test burn samples representing a worst-case scenario of highest metals concentrations detected in the soil, and

a composite sample of tank and pit sludges representing average metals concentrations in the sludge; and

- To provide data to allow for a more complete evaluation of thermal treatment.

3.3 Treatability Study Procedures

The following treatability study procedures are designed to simulate a rotary kiln burn, including the generation of ash with characteristics similar to that expected from a full-scale burn. The procedures cover sample types to be burned, treatability process trials, process sample analyses, test data collection and evaluation, and reporting of test results.

3.3.1 Soil Samples for Testing

Samples for test burns have been selected to be representative of the metals concentrations in site soils and sludges. All site sampling and sample compositing will be performed in accordance with the Sampling Plan dated 24 January 1989. Three, 5-gallon containers of each of the following samples will be received by the subcontractor:

- Hot Spot Soil Composite - Metals, and

- Sludge Tank and Pit Composite.

3.3.2 Treatability Study Procedure

The pilot-scale rotary kiln treatability testing will be conducted by Energy and Environmental Resources (EER) of Irvine, California. The tests will be performed as screening tests, utilizing a batch kiln and two separate samples, each

approximately fifteen pounds, to approximate a full-scale continuous kiln.

The scope of the test will cover evaluating the results of treating each sample in a combustion chamber, but not include the specifics of the waste preprocessing and feed system, a heat recovery system, or specific air pollution control device(s). The test will monitor the kiln operation and discharged streams. The test will determine the temperature and residence time for destruction of the organics, the residual organic concentrations, and the fate of metals in the treatment ash.

The SCP/Carlstadt site has a shallow ground water table. Therefore, certain site soils and sludges will be moist or saturated. Any water that settles out of the sample during shipment, will be mixed back into the sample before testing.

EER test burns will simulate the conditions that would exist within a full-scale rotary kiln, including the contacting of gases and solids, the residence time at the selected kiln temperature, and the gas-phase conditions. The residence time in a full-scale system will be simulated by a longer residence time in the pilot system. This compensates for the shorter time of travel for the batch in the pilot scale system. Although the results from this treatability study will not suggest a full scale design, the information will be sufficient to evaluate the feasibility of a thermal treatment alternative in the FS.

Test samples will be batch-fed to the high temperature rotary kiln and thermally treated at various residence times and combustion temperatures. The purpose is to determine the minimum combustion temperature which, along with the afterburner combustion, will result in 99.9999 percent destruction of PCBs, and minimize excessive fumes containing high levels of metals. Ideally, at acceptable temperatures, any metals released as air

emissions will be of an acceptable particle size, so as to be effectively removed with standard air pollution controls.

Testing procedures are as follows:

1. The typical sample feed size will be approximately ten to fifteen pounds, and the residence times will be 30 minutes and 60 minutes;

2. The pilot kiln will have a maximum operating temperature of 3,000 degrees F, and the kiln afterburner will have a maximum temperature of 2,400 degrees F. Combustion temperatures of 1,500; 1,800; and 2,400 degrees F will also be evaluated. An afterburner temperature of 2,400 degrees F will be evaluated.

3. The feed and incinerator ash will be analyzed for the following:

   - Metals (TCL)
   - EPTox for leachable metals
   - PCB organics
   - Elemental analysis of C, H, N, S, Cl.

4. The afterburner off-gas stream will be analyzed for the following:

   - Hydrogen Chloride
   - Total PCB
   - O_2, CO, CO_2, NOX, SO_2 (continuous monitoring)
   - Total hydrocarbons (GC)
   - Particulate Metals (TCL)
   - Depending on amount of collected particulates, EPTox leachable metals

Refer to Tables 6-1 and 6-2 for outlines of chemical analytical methods.

3.4 Test Burn Data Evaluation

The treatability study will evaluate the results of the test burns. Each test burn will be evaluated by:

- Analyzing the operating conditions required to achieve 99.9999% destruction of PCBs, and to combust and remove the organics; and

- Analyzing the raw particulate and the ash-sample data to determine the fate of metals for each residence time and test burn temperature.

3.5 Reporting of Test Results

EER will provide the following information:

- Summary of the procedures used to perform the test burns.

- Analytical results of the feed, ash, and after burner off-gas emissions including particulates for each test burn condition.

- Descriptions of the test burn conditions evaluated, and any variations or difficulties observed during the pilot testing.

- Recommendations to use batch data to estimate full-scale continuous operating conditions.

- Recommendations for further evaluation of thermal treatment processes.

- Preliminary capital and operating costs for full-scale units.

SECTION 4

CONTAMINANT EXTRACTION

4.1 Introduction

This portion of the Treatability Study will be conducted to determine the feasibility of extracting metals, PCBs, and various organics from surface soils and sludges. The following scope of work describes the extraction processes to be evaluated, the treatability study objectives and procedures, and the basis for selection of soil and sludge samples for treatability. This study is not intended to optimize the contaminant extraction process for the site, or to result in a process design.

4.2 Process Definition

Contaminant extraction involves the application of a solvent solution to dissolve or flush contaminants from soils and sludges, and the subsequent collection and processing of the spent extraction solution. Contaminant extraction is a physical-chemical process in which chemical compounds in the soil and sludges are transferred to a liquid solvent (or extraction fluid). Water is generally evaluated as the extraction fluid, although dilute acids or bases, chelating agents, aqueous surfactant solutions, or organic solvents may be needed for application of this technology to site soil and sludge treatment. The basic principle behind contaminant extraction is that, upon contact of the soil/sludge with certain extraction fluids, the chemical bonding between the compounds and the soil/sludge particles can be broken. The exact nature of the extraction

fluid required depends on the chemical nature of substances to be removed and the mineralogy of the soil.

4.3 Objectives

The objectives of this contaminant extraction study are as follows:

1) To determine the applicability of contaminant extraction technologies;

2) To determine the effectiveness (i.e., percent contaminant removals achieved) of various contaminant extraction fluids and contact times in treating the soils and sludges; and

3) To provide a preliminary indication of promising extraction fluids and process options for remediating site soils and sludges.

Process variables to be evaluated in this treatability study include types of extraction fluid and contact times between sample and fluid. In addition, the use of both single and multiple fluid type processes will be evaluated.

The performance and cost of contaminant extraction technologies is waste-specific, and treatability tests are necessary to meet the objectives above. The extraction fluids and contact times to be tested are selected on the basis of chemical and physical properties of the soil and sludge and their associated contamination, contaminant extraction case histories, or engineering calculations.

4.4 Treatability Study Procedures

The following procedures are designed to evaluate a range of contaminant extraction processes. Although the chemical phenomena of the treatability study are the same as those for full scale extraction processes, the treatability study does not simulate a full scale operation. The following procedures cover the selection of sample types to be studied, raw sample characterization, treatability process trials, process sample analyses, test data collection and evaluation, and reporting of test results.

4.4.1 Soil and Sludge Samples for Treatability Tests

Soil and sludge samples for treatability have been selected to be representative of the conditions at the SCP/Carlstadt site. All site sampling and sample compositing will be performed in accordance with the Sampling Plan dated 24 January 1989. Contaminant extraction for all soil/sludge samples will be performed by ERM at its laboratory. Three 5-gallon containers of each of the following samples will be utilized:

1) Soil Hot Spot - Lead

2) Soil Hot Spot - PCBs

3) Soil Hot Spot Composite

4) Overall Soil Composite

5) Sludge Hot Spot - Base Neutrals (B/Ns)

6) Sludge Tank and Pit Composite

Details about the above sample types are provided in the Sampling Plan dated 24 January 1989. Field composite samples are formed in layers. Contents are then mixed in the ERM laboratory, prior to initiation of study. Volatilization during mixing will be minimized by limiting handling of the samples during sample preparation and the process trials. Steps to be taken include minimizing mixing time and contact of soil/sludge with the open atmosphere. Sample amounts may be approximately twice that required to allow adequate sample for additional testing, if necessary.

4.4.2 Raw Sample Characterization

A one-gallon portion of each sample type received at the ERM Laboratory will be shipped directly to Lancaster Laboratory for raw sample analyses. Table 6-1 provides information concerning the analyses. Sample characterization will provide a baseline for comparison to processed sample characteristics, so that process performance can be evaluated.

4.4.3 Process Trials

The following process trials are designed to measure the effectiveness of contaminant extraction utilizing high-shear batch agitation. Batch agitation will occur in a mechanical shaker flask. The batch trials will evaluate the effects of a number of process variables including the type and strength of extraction fluid(s), and the contact time per extraction stage. The batch trials for this preliminary treatability study will not completely simulate actual full-scale contaminant extraction systems. A full scale extraction system will have more complex configurations and operations than represented by these preliminary trials. The two types of process trials to be conducted are: 1) Kinetic Process Trials employing three extractions with a single type of extraction fluid, and 2) a

single Sequential Process Trial employing three different extraction fluids for specific types of sludge and soil samples.

Initially, uncontaminated soil samples will be contacted with each fluid type. This will be conducted prior to actual treatability testing of site samples to confirm through visual observation that there are no dramatic effects of the fluids on the soils without the presence of contamination.

The following criteria are used for the selection of extraction fluids to be used in the initial process trials:

1) Miscibility of extraction fluid with sample contaminants;

2) Known ability of the fluid to dissolve sample contaminants;

3) Demonstrated extraction performance of the fluid in case histories cited in the literature;

4) Fluid viscosity; and

5) Fluid toxicity.

The ERM laboratory will evaluate the following types of contaminant extraction fluids for the potential remediation of the soil/sludge indicated below:

Contaminant	Extraction Fluids to Be Evaluated
Heavy metals	Hydrochloric acid solution
PCBs	CITRIKLEEN (a proprietary citrate-based solvent potentially capable of PCB removal)
Petroleum hydrocarbons, volatiles, semivolatiles, and phenolics	Aqueous surfactants

The above fluids have been shown, in other bench-scale or pilot-scale systems, to be effective for contaminant extraction.

Each Kinetic Process Trial will involve contaminant extraction of a single 25g sample of soil (or sludge) in three successive stages using the same type of fresh extraction fluid. Four extraction fluids of specified strengths will be used in separate trials on specific sample types. These fluids and the chemical classes they are expected to remove are listed below:

- A 10% hydrochloric (HCl) acid solution to remove metals;
- A 5% aqueous surfactant solution to remove volatile organic compounds (VOCs), base neutrals (B/Ns), acid extractables (A/Es), polychlorinated biphenyls (PCBs), and petroleum hydrocarbons (PHCs);
- A 5% CITRIKLEEN solution, primarily to remove PCBs and any other organics that may be held to the soil (or sludge) matrix; and

- A 10% CITRIKLEEN solution, also to remove PCBs and any other organics that may be held tighter to the soil.

The sample types selected for the Kinetic Process Trials, with respect to the type of fluid to be used to extract the sample type are as follows:

- HCl: The Soil Hot Spot - Lead, the Soil Hot Spot Composite, the Overall Soil Composite, and the Sludge and Tank Pit Composite; and

- Surfactant: The Soil Hot Spot - PCBs, the Soil Hot Spot Composite, the Overall Soil Composite, and the Sludge and Tank Pit Composite.

- CITRIKLEEN (5% and 10%): Soil Hot Spot - PCBs, the Overall Soil Composite, Sludge Hot Spot - Base Neutrals (B/Ns), and the Sludge Tank and Pit Composite.

Each extraction stage in a Kinetic Process Trial will involve mixing the sample with 250 ml of unused (or "fresh") extraction fluid, agitating the mixture for a preselected stage contact time, and decanting the fluid through a fine screen selected to retain soil particles (phase separation). The following stage and system contact times will be employed:

1. 10, 30, and 60 minutes contact per stage for the three HCl extractions, respectively, conducted on each of four (4) sample types as specified above. The different stage contact times would result in 30, 90 and 180-minute total system contact times, respectively;

2. 15, 30, and 45 minutes contact per stage for the three surfactant extractions, respectively, conducted on each of four (4) sample types as specified above. These different

stage contact times would result in 45, 90, and 135-minute total system contact times, respectively;

3. 15, 30, and 45 minutes contact per stage for the three 5% CITRIKLEEN extracts, respectively, conducted on each of four (4) sample types as specified above. These different stage contact times would result in 45, 90, and 135-minute total system contact times, respectively.

4. 15, 30, and 45 minutes contact per stage for the three 10% CITRIKLEEN extracts, respectively, conducted on each of four (4) sample types as specified above. These different stage contact times would result in 45, 90, and 135-minute total system contact times, respectively.

The variation in contact times among Kinetic Process Trials will allow a preliminary evaluation of the relative extraction performance for each sample type.

The decanted extraction fluids from each stage will be combined into one fluid sample composite, and will be shipped to Lancaster Laboratory for analysis. Following the final extraction with HCl (i.e., after the third stage), the sample will be washed for one minute with distilled water to remove residual HCl, and then washed with a 10% sodium carbonate solution to neutralize the sample. This composite will not include the used water wash or carbonate solution. Figures 4-1 through 4-4 provide process flow diagrams for the kinetic trials. Table 6-2 lists the parameters for which each of the fluid composites and the treated solid samples will be analyzed, as well as the analytical program to be followed.

In contrast, each Sequential Trial will involve contaminant extraction of a single 25g sample of soil (or sludge) in three successive stages, using a different type of extraction fluid in

FIGURE 4-1

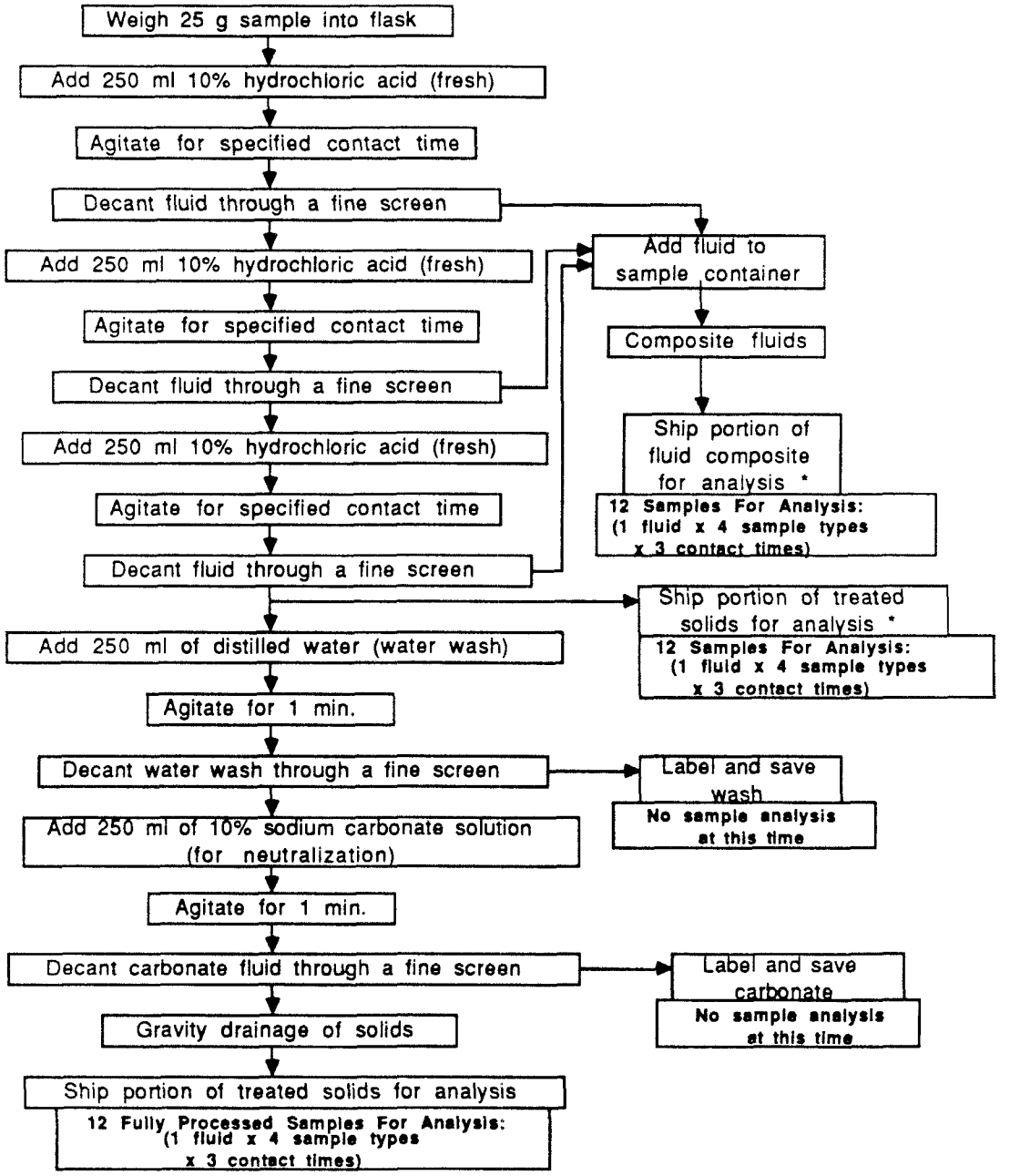
CONTAMINANT EXTRACTION TREATABILITY
SCP/CARLSTADT SITE

Kinetic Process Trials Employing Hydrochloric Acid for Metals Extraction

APPLIES TO SAMPLE TYPES:
1) Soil Hot Spot- Lead
2) Soil Hot Spot Composite
3) Overall Soil Composite
4) Sludge Tank and Pit Composite

TRIAL DESIGN PARAMETERS:
- o Type of Extraction: High-Shear Batch Agitation (in shaker flask)
- o Number of Stages per Trial: 3
- o Number of Extraction Fluids: 1 per trial
- o System Contact Times: (To vary among trials)
  - 30 minutes; 10 minutes per stage
  - 90 minutes; 30 minutes per stage
  - 180 minutes; 60 minutes per stage
- o Extraction Fluid Strength: 10% hydrochloric acid
- o Fluid Application Ratio: 25 g soil/sludge sample/ 250 ml fluid

PROCESS FLOW: 12 Process Trials: (1 fluid x 4 samples x 3 contact times)



* Table 6-2 provides details of analysis

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FIGURE 4-2

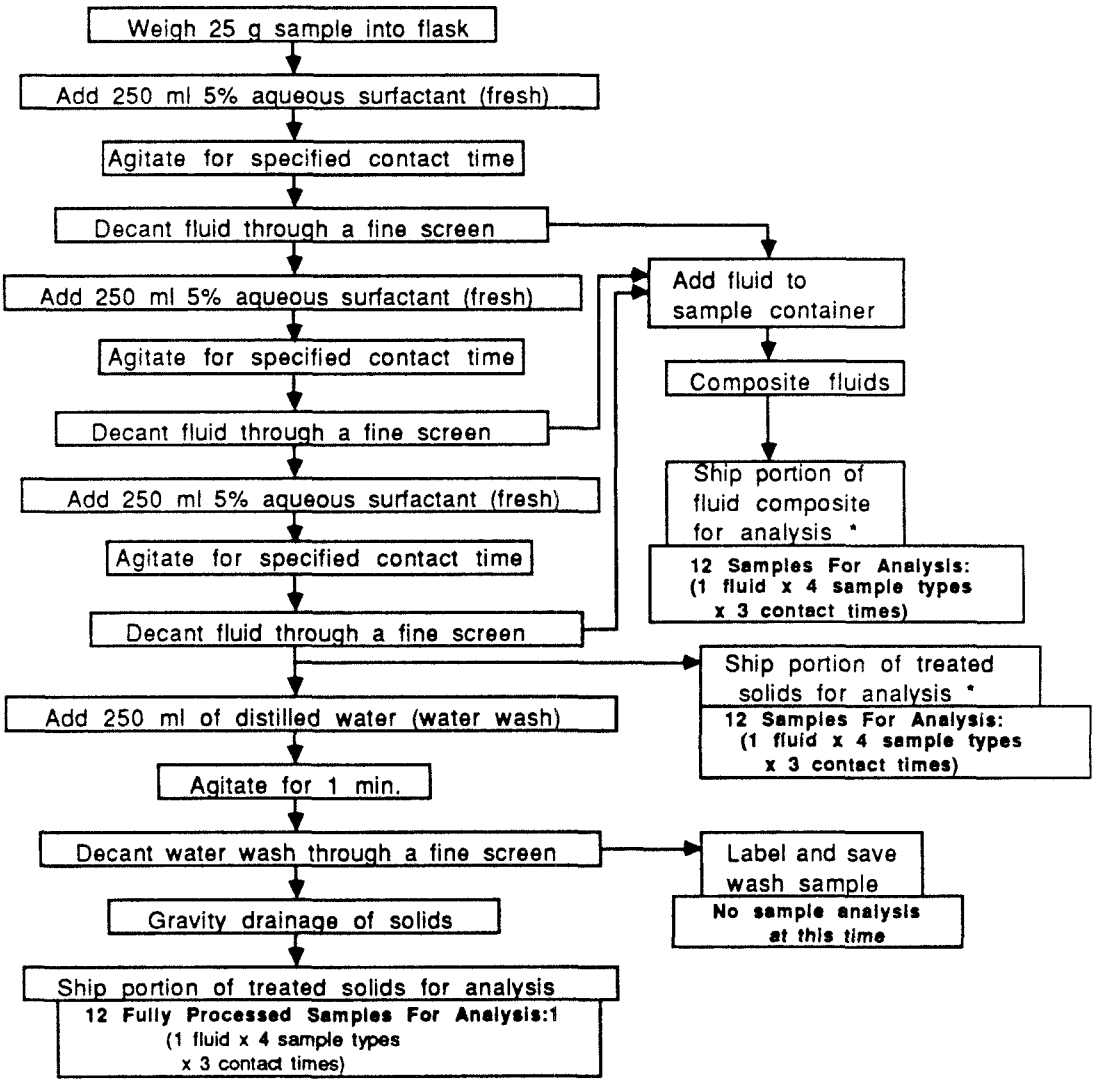
CONTAMINANT EXTRACTION TREATABILITY
SCP/CARLSTADT SITE

Kinetic Process Trials Employing Aqueous Surfactant for Organics Extraction

APPLIES TO SAMPLE TYPES:
1) Soil Hot Spot- PCBs
2) *Soil Hot Spot Composite*
3) Overall Soil Composite
4) Sludge Tank and Pit Composite

TRIAL DESIGN PARAMETERS:
- o Type of Extraction: High-Shear Batch Agitation (in shaker flask)
- o Number of Stages per Trial: 3
- o Number of Extraction Fluids: 1
- o System Contact Times: (To vary among trials)
  - 45 minutes; 15 minutes per stage
  - 90 minutes; 30 minutes per stage
  - 135 minutes; 45 minutes per stage
- o Fluid Strength: 5% aqueous surfactant
- o *Fluid Application Ratio: 25 g sample/ 250 ml fluid*

PROCESS FLOW: 12 Process Trials: (1 fluid x 4 sample types x 3 contact times)



* Table 6-2 provides details of analysis

FIGURE 4-3

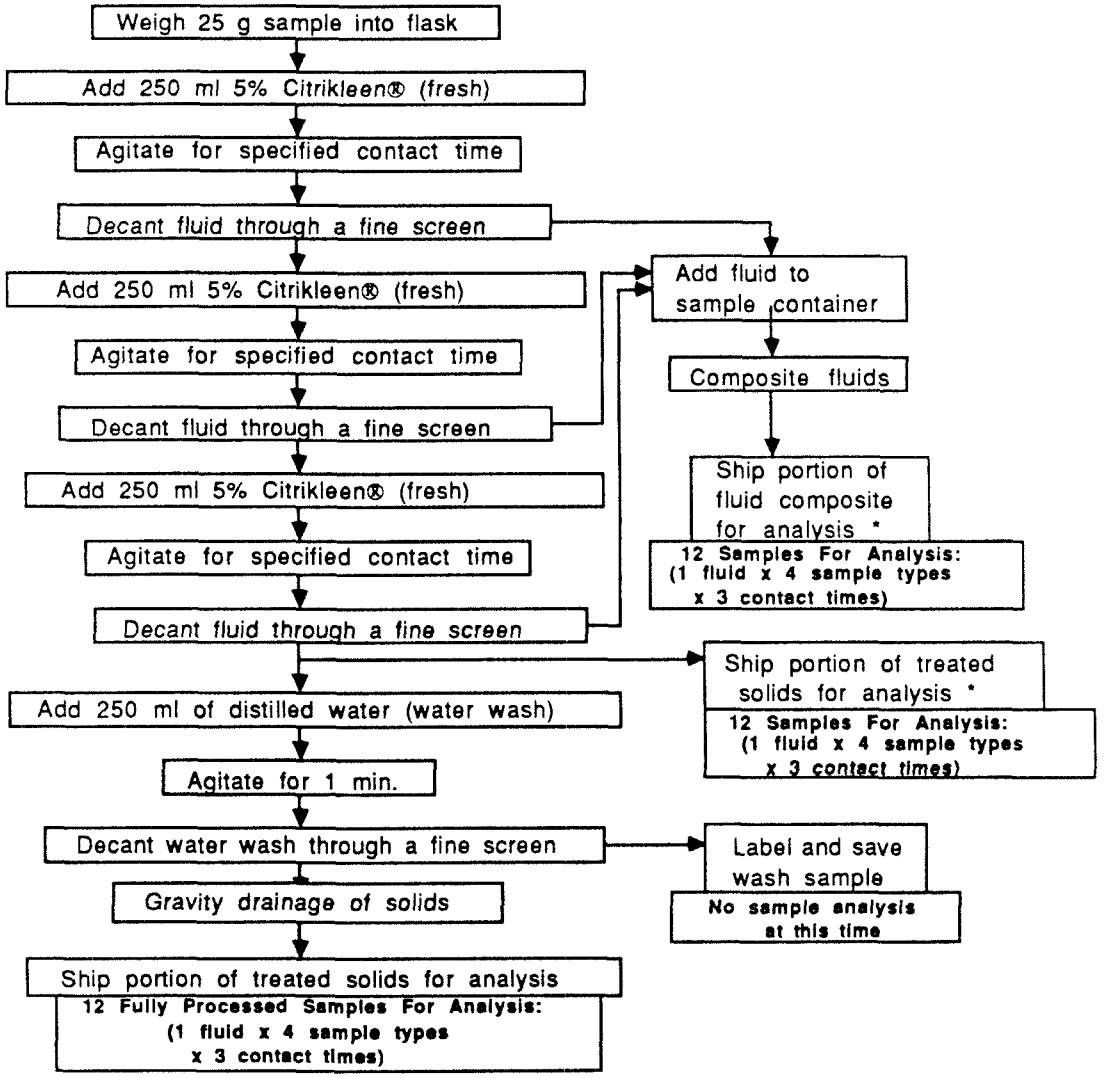
CONTAMINANT EXTRACTION TREATABILITY
SCP/CARLSTADT SITE

Kinetic Process Trials Employing 5% Citrikleen® for PCBs Extraction

APPLIES TO SAMPLE TYPES:
1) Soil Hot Spot- PCBs
2) Overall Soil Composite
3) Sludge Hot Spot- Base Neutrals (B/Ns)
4) Sludge Tank and Pit Composite

TRIAL DESIGN PARAMETERS:
- o Type of Extraction: High-Shear Batch Agitation (in shaker flask)
- o Number of Stages per Trial: 3
- o Number of Extraction Fluids: 1
- o System Contact Times: (To vary among trials)
  - 45 minutes; 15 minutes per stage
  - 90 minutes; 30 minutes per stage
  - 135 minutes; 45 minutes per stage
- o Fluid Strength: 5% Citrikleen®
- o Fluid Application Ratio: 25 g sample/ 250 ml fluid

PROCESS FLOW: 12 Process Trials: (1 fluid x 4 sample types x 3 contact times)



* Table 6-2 provides details of analysis

FIGURE 4-4

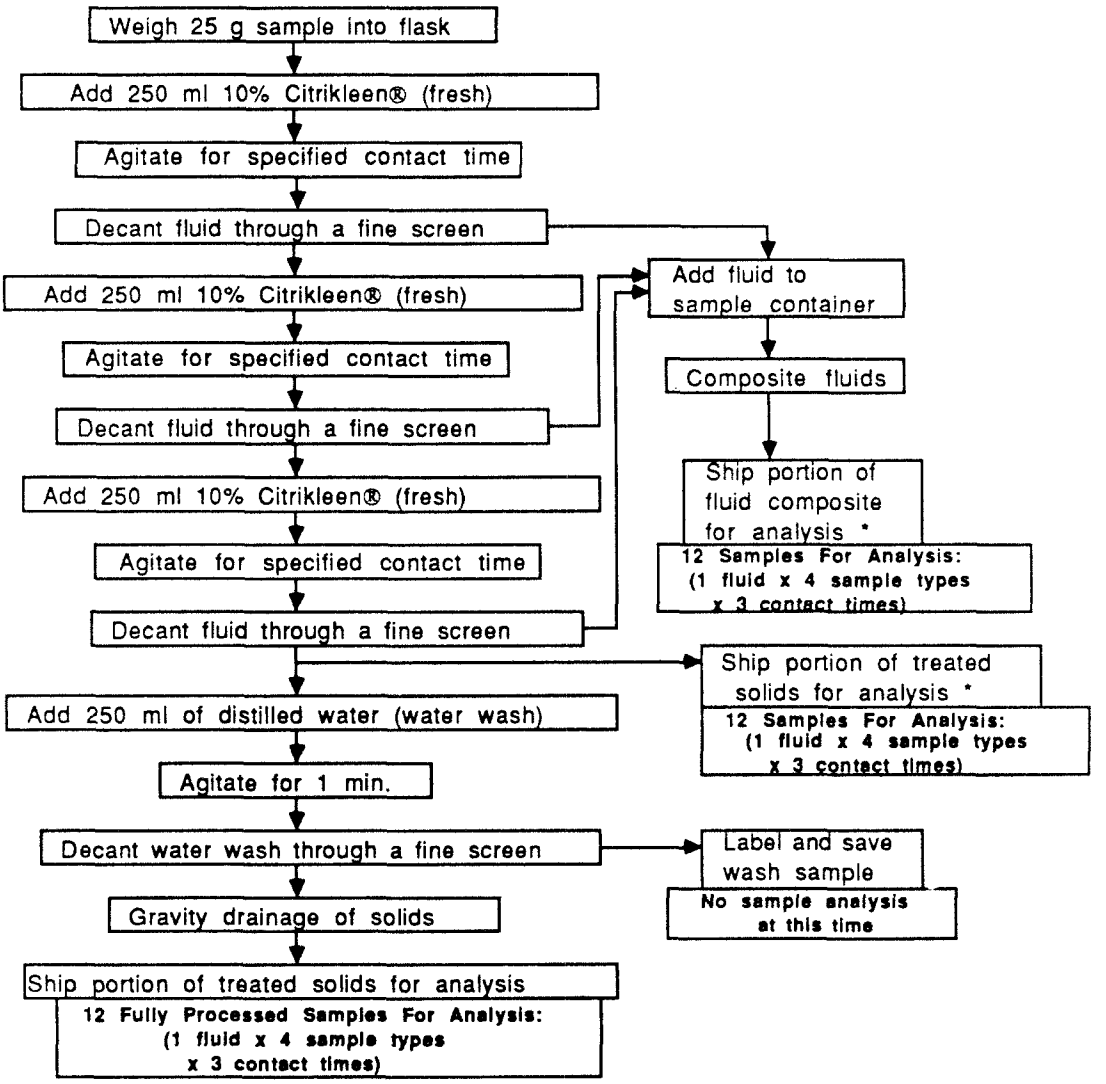
CONTAMINANT EXTRACTION TREATABILITY
SCP/CARLSTADT SITE

Kinetic Process Trials Employing 10% Citrikleen® for PCBs Extraction

APPLIES TO SAMPLE TYPES:
1) Soil Hot Spot- PCBs
2) Overall Soil Composite
3) Sludge Hot Spot- Base Neutrals (B/Ns)
4) Sludge Tank and Pit Composite

TRIAL DESIGN PARAMETERS:
- o Type of Extraction: High-Shear Batch Agitation (in shaker flask)
- o Number of Stages per Trial: 3
- o Number of Extraction Stages: 1
- o System Contact Times: (To vary among trials)
  - 45 minutes; 15 minutes per stage
  - 90 minutes; 30 minutes per stage
  - 135 minutes; 45 minutes per stage
- o Fluid Strength: 10% Citrikleen®
- o Fluid Application Ratio: 25 g sample/ 250 ml fluid

PROCESS FLOW: 12 Process Trials: (1 fluid x 4 sample types x 3 contact times)



* Table 6-2 provides details of analysis

FIGURE 4-5

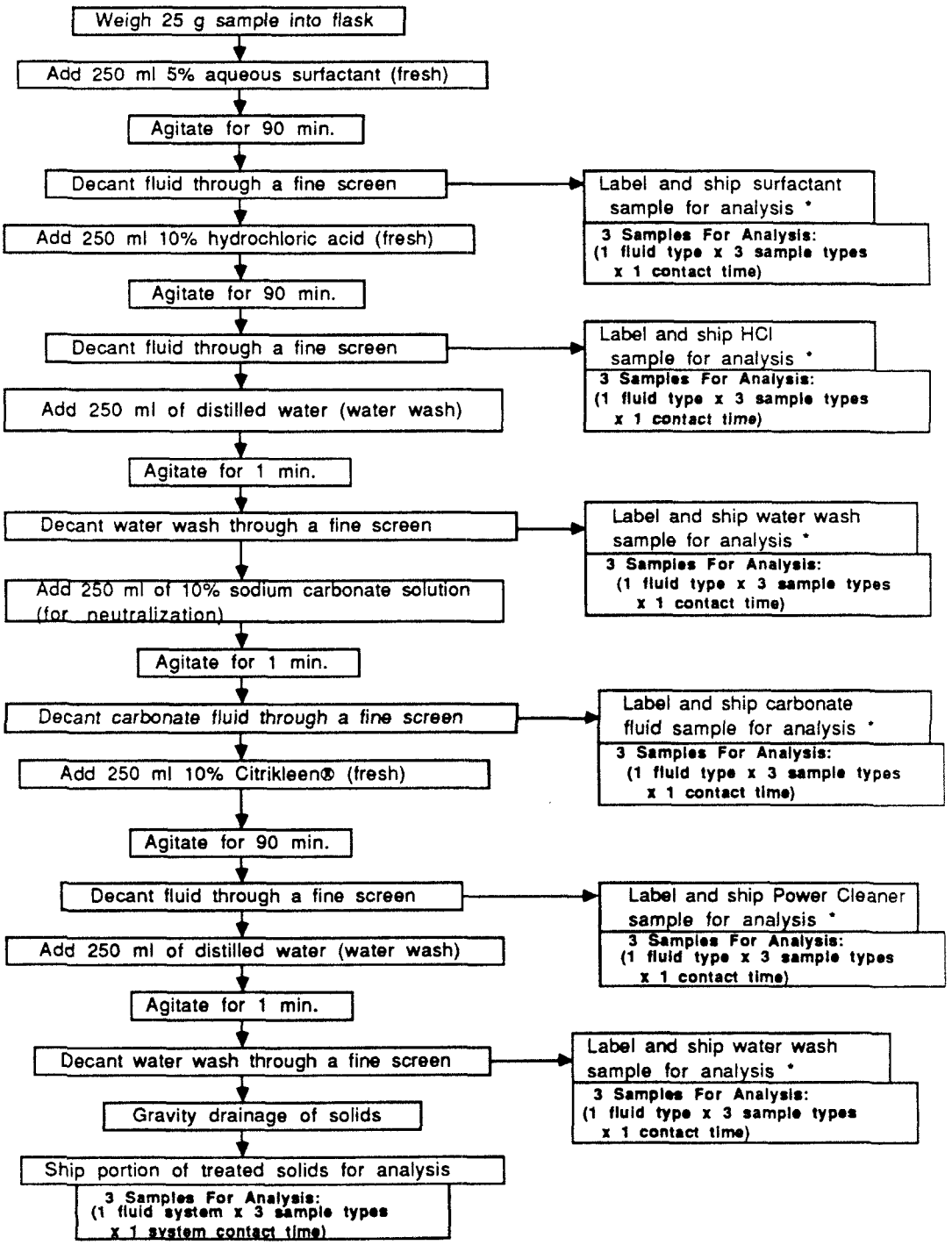
CONTAMINANT EXTRACTION TREATABILITY
SCP/CARLSTADT SITE

Sequential Extraction Process Trials for Metals and Organics Removal (Including PCBs)

APPLIES TO SAMPLES:
1) Soil Hot Spot Composite
2) Overall Soil Composite
4) Sludge Tank and Pit Composite

TRIAL DESIGN PARAMETERS:
- o Type of Extraction: High-Shear Agitation (in shaker flask)
- o Number of Stages per Trial: 3
- o Number of Fluid Types: 3
- o Fluid Strengths: Varies, as indicated to left
- o Fluid Application Ratio: 25 g sample/ 250 ml fluid
- o System Contact Times = 270 minutes:
  - 90 minutes for 5% aqueous surfactant
  - 90 minutes for 10% hydrochloric acid (HCl)
  - 90 minutes for 10% Citrikleen® 155

PROCESS FLOW: 3 Process Trials: (1 fluid system x 3 sample types x 1 system contact time)



* Table 6-2 provides details of analysis

each stage (i.e., application of different fluids in sequence). The following fluids will be used:

- A 5% aqueous surfactant solution (first stage);
- A 10% hydrochloric (HCl) acid solution (second stage); and
- A 10% CITRIKLEEN solution (third stage).

The sample types selected for the Sequential Extraction Process trials are as follows:

- soil hot spot composite,
- overall soil composite, and
- sludge tank and pit composite.

Each extraction stage will involve mixing and agitating of a 25g sample with 250 ml of fresh extraction fluid for 90 minutes, and effecting a phase separation. The 90 minute contact time is selected to provide sufficient opportunity for contaminant extraction, and possibly to allow comparing the data with that of the Kinetic Process Trials. Following the HCl extraction (the second stage), the sample will be washed for one minute with distilled water to remove residual HCl, and then washed with a 10% sodium carbonate solution to neutralize the sample. Figure 4-5 provides a process flow diagram for the sequential trials.

In contrast to the Kinetic Process Trials, the used extraction fluid from each stage of the sequential trials will be collected and analyzed separately, because each fluid represents a different chemical system with different removal capabilities. Consequently, for each sequential trial, three extraction fluid samples will be analyzed: aqueous surfactant, hydrochloric acid,

and CITRIKLEEN. In addition, the used sodium carbonate solution and the wash water used in each trial will be sampled and analyzed. Table 6-2 lists the analytical parameters and program to be followed for each sample type subjected to the sequential trials.

4.5 Test Data Evaluation

The data from both the Kinetic and the Sequential Process Trials will be evaluated to make the following determinations for each sample and fluid type:

1. Ability of a given fluid type (or sequence of different fluids) to extract specific classes of chemicals from a given sample type in a three-stage batch process;

2. Percent contaminant removals as determined by analysis of specific chemical compounds (See Table 6-2);

3. Residual contaminant concentrations for each extracted sample;

4. Estimated required contact time; and

5. Additional treatment required for spent extraction fluid.

Plots of residual concentrations of specific chemicals (or chemical classes) in the treated samples versus the system contact time, will be developed for each of the Kinetic Process Trials. Specifically, these plots will indicate the potential point of diminishing return and the potential minimum contact time to achieve a minimum chemical residual.

After the completion of all process trials, extraction fluids will be ranked according to their relative performance for removing certain chemical compounds (or classes of compounds).

Extraction performance data, in combination with case history data, will also be used in the feasibility study to estimate a possible number of extraction stages for full-scale processing.

4.6 Reporting of Test Results

ERM will provide a brief treatability study report containing the following information:

1. Summary of the basic procedures used to perform the process trials;

2. Summary of the contaminant extraction process performance data, including percent contaminant removals and residual concentrations in the soils and sludges;

3. Identification of the chemical process variables (i.e., sample preparation methods, type(s) of extraction fluids, stage and system contact times, and sample weight to extraction fluid volume ratio) used to develop each of the process trials;

4. A concise evaluation of the ability of alternative contaminant extraction processing methods to accommodate the physical and constituent characteristics of the site; and

5. Recommendations for further evaluation of selected extraction processes and extraction fluid systems.

SECTION 5

SHALLOW GROUND WATER TREATABILITY STUDIES

5.1 Introduction

Ground water data for the shallow ground water table aquifer at the SCP/Carlstadt Site contains a wide range of organic and inorganic constituents. These compounds have a total concentration of approximately 1,500 mg/l in the ground water, as shown in Table 5-1. Because of the variety of compounds present, a series of unit treatment processes will likely be needed to achieve acceptable effluent levels of both organics and inorganics. Because chemicals have a complex matrix and there are elevated levels of organics in the water, treatability studies on the shallow ground water are preferable to desktop studies, to provide a defensible basis for estimating performance and projected cost.

Based on the constituents detected in the ground water, the following representative ground water treatment alternatives seem effective for treating the constituents present in the shallow ground water table aquifer:

1. Vacuum enhanced steam stripping with/without granular activated carbon (GAC) or UV/peroxidation polishing; chemical precipitation for metals removal.

2. Critical-fluid (CO_2) extraction, with/without polishing by GAC or UV/peroxidation; chemical precipitation for metals removal.

TABLE 5-1

COMBINED WATER TABLE AQUIFER SAMPLING DATA
(From 21 December 1987 and 23 July 1988)
SCP/CARLSTADT, NEW JERSEY

Compound	Average Concentration mg/l	Maximum Concentration mg/l	Number of Occurrences
Volatile Organics			
chloroform	304	614	4
1,2 dichloroethane	221	473	4
trichloroethylene	72.2	161	8
1,1,2,2-tetrachloroethane	4.40	7.35	4
tetrachloroethylene	16.9	24.5	3
1,1-dichloroethylene	0.400	0.400	1
benzene	3.48	6.83	10
vinyl chloride	3.86	7.29	9
2-butanone (MEK)	648	2,000	5
trans-1,2-dichloroethylene	17.1	64.7	12
chlorobenzene	3.57	6.56	3
toluene	26.8	90.9	14
1,1-dichloroethane	3.08	11.7	8
methylene chloride	55.9	200	10
1,2-dichlorobenzene	0.076	0.192	12
1,1,1-trichloroethane	35.4	81.2	5
ethylbenzene	2.02	3.90	6
chloroethane	2.42	2.42	1
total xylenes	13.20	35.6	8
Subtotal	1,434	3,792	
Semi-volatile Organics			
bis(2-chloroethyl)ether	1.32	1.39	2
benzo[a]pyrene	0.090	0.090	1
bis(2-ethylhexyl)phthalate	0.269	0.654	5
2,4-dimethylphenol	0.275	0.109	11
phenol	3.46	17.1	14
diethyl phthalate	0.216	0.416	2
2,4-dichlorophenol	0.349	0.463	2
di-n-butylphthalate	0.165	0.318	2
2-chloronaphthalene	0.019	0.019	1
2-chlorophenol	0.016	0.018	2
2-nitrophenol	0.0045	0.0045	1
acenaphthene	0.013	0.040	4
acenaphthylene	0.040	0.074	2
anthracene	0.126	0.126	1
benzo[b]fluoranthene	0.141	0.141	1
butylbenzyl phthalate	0.010	0.010	1
chrysene	0.088	0.088	1
dimethyl phthalate	0.316	0.316	1
fluoranthene	0.091	0.266	3
fluorene	0.070	0.133	2
indeno[1,2,3-c,d]pyrene	0.060	0.060	1
isophorone	2.61	8.45	5

TABLE 5-1 (con't)

Compound	Average Concentration mg/l	Maximum Concentration mg/l	Number of Occurrences
Semi-volatile organics con't			
naphthalene	0.132	1.22	13
nitrobenzene	42.5	57.9	4
phenanthrene	0.316	0.620	2
pyrene	0.228	0.228	1
Subtotal	52.9	90.3	
Metals (Dissolved)			
arsenic	0.29	1.60	6
silver	0.110	0.110	1
nickel	0.063	0.15	9
copper	0.029	0.060	9
zinc	0.128	0.690	10
mercury	0.0002	0.0002	1
beryllium	0.001	0.001	3
chromium	0.370	0.420	2
Subtotal	0.99	3.03	
PCBs			
PCB 1242	4.340	17	4
Pesticides			
Beta-BHC	0.0005	0.0005	1
DDT	0.001	0.001	2
DDE	0.001	0.001	1
Endrin	0.006	0.006	1
Endrin Aldehyde	0.008	0.015	
Subtotal	0.017	0.024	

3. Granular activated carbon pretreatment followed by UV/peroxidation or biological treatment; with/without chemical precipitation for metals removal.

4. Chemical oxidation pretreatment via Fenton's reagent followed by biological treatment (SBRs), with/without carbon polishing; chemical precipitation for metals removal.

5. Biological treatment with/without powdered activated carbon (PACT), with/without UV/peroxidation polishing; with/without chemical precipitation for metals removal.

6. UV/peroxidation followed by GAC polishing; chemical precipitation for metals removal.

While this list of options does not represent all the permutations of possible treatment processes, it provides a sufficient diversity of alternatives to serve as a basis for deciding the feasibility of needed treatability studies in the time frame allotted.

To design an effective remedy for site ground water, both the present and anticipated future ground water quality and flow to be treated should be known. The economic feasibility of certain of the treatment alternatives listed above are sensitive to flow rate. Critical-fluid extraction becomes significantly less costly on a cents-per-gallon basis as flow rate is increased. This is because of the system's high initial capital cost. UV/peroxidation becomes noticeably more costly as flow is increased because of increased power demand. The economic and process feasibility of certain of these options are also affected by concentration. At organic concentrations below several hundred parts per million (ppm), steam stripping cannot be justified. Critical-fluid extraction is not economically justifiable at levels below approximately 1,000 ppm. Biological systems need at least 50 ppm of degradable organics to sustain

adequate bacterial populations, and GAC is not advised where mass loadings are high, due to the need for more frequent regeneration, which is costly. The feasibility of metals precipitation via chemical coagulation depends upon having sufficient metal ions in solution to enable their precipitation.

Table 5-2 provides a listing of each technology and the time required for actual treatability trials on the primary treatment process for each alternative. Under "rush" conditions, laboratory turnaround is expected to be a minimum of ten days, excluding sample shipment. To properly evaluate polishing treatments, the effluent from the primary treatment process should be used as the influent for the polishing treatability study. This requires treatability trials for a given proposed process train to be run sequentially on the processes proposed. The short time period limits the scope of sequential treatability work that can be performed.

From these constraints, it is evident that alternatives entailing biological treatment cannot be studied at this time. In addition, since biological treatment cannot be evaluated within the present FS/FOU timeframe, it is not possible at this time to perform Fenton's reagent (chemical oxidation) pretreatment on the wastewater prior to biological treatability studies. Similarly, it is not prudent to perform chemical precipitation trials on raw ground water when activated carbon or biological treatment, if found promising for organics removal, can also effect the removal of metals. The results of carbon or biological studies would come too late to allow evaluation of metals treatment within the time frame of the treatability studies. The only multi-step treatability work that can be accomplished would be that of steam stripping or critical-fluid extraction followed by UV/peroxidation. The primary technologies of steam stripping, UV/peroxidation, critical fluid extraction, and granular activated carbon can also be evaluated during this period.

TABLE 5-2

OVERVIEW OF GROUND WATER TREATABILITY WORK

Technology	Vendor	Duration of Testing (weeks)	Sample Size Required (gal)	Capability During Required Time Period	Type of Test
Steam stripping	APV Crepaco	2 (a)	2	yes	Process simulation
Critical-fluid extraction	CF Systems	1 (a)	2	yes	Batch extraction
UV/Peroxidation	PSI	1 (a)	10	yes	Process simulation
Chemical oxidation (as biological pretreatment)	ERM	1 (a)	N/A	no (b)	Batch test
Chemical precipitation	ERM	1.5 (a)	N/A	no (c)	Batch test
Biological treatment	ERM	6 (a)	N/A	no	Continuous flow-through test
Granular activated carbon (GAC)	Calgon	3.5 (a)	15	yes	Accelerated column test

(a) excludes analytical time or evaluation of results

(b) trials not warranted until biological treatability commences

(c) trials not warranted until after primary organics treatment efficiency and the need for polishing with GAC are determined

At this time only these four technologies will be evaluated via treatability studies. Those technologies not tested at this time (i.e., biological treatment and polishing treatment for metals) may be considered for treatability testing in the Remedial Design Phase.

The following sections outline the intended scope of treatability work for steam stripping, critical-fluid extraction, UV/peroxidation, and granular activated carbon. While the influent in the treatability studies will differ greatly between the primary and polishing treatment stages, this will be the only variable factor in the treatability tests. The basic methods of testing used would not change, although the operational parameters used in the testing would likely be changed. For this reason, there is no need to address treatability methods for polishing versus primary treatment separately below.

5.2 Scope of Treatability Work

5.2.1 Stream Stripping

Objectives

Steam stripping treatability testing will be performed to evaluate the degree to which organics can be removed from the ground water matrix. Testing is appropriate since, in a multicomponent matrix, behavior of organics cannot necessarily be predicted according to the ideal gas law. Therefore, calculations based on Henry's Law and concentration may not adequately characterize the performance of the process.

Process Description

Steam stripping consists of passing steam countercurrent to a preheated ground water stream in a packed tower to strip organics into the vapor phase. The overheads from the column are routed to a condenser, which can be cooled using ground water in a non-contact mode. From the condenser, the condensate flows to a decanter where the organic layer is drawn off and the bottoms are routed to the stripper tower influent. Effluent from the stripping tower is routed to a polishing treatment or discharge. Variations of steam stripping may involve low, moderate, or high vacuum (negative pressure) stripping. By maintaining the stripping column at a negative pressure, more efficient stripping of organics at lower temperatures can be achieved, thereby reducing the cost of energy required to heat the influent ground water to the desired operating temperature. Steam stripping has been shown to be effective at removing a wide variety of organic substances; metals present in the ground water would not be removed by this process.

Treatability Study Procedures

Two gallons of ground water collected from the site will be supplied to the vendor, APV Crepaco, Tonawanda, New York, for testing in a small-scale steam stripper system designed to model a standard heat exchanger, column with reboiler, and condenser. Samples passed through the unit will be collected as separated condensate and bottoms streams, and analyzed as described in Section 3 below. In addition, column temperature and pressure data will be taken.

Test Data Evaluation

The results of the chemical analyses and other data collected will be used by APV Crepaco to assess full-scale system

performance and provide preliminary equipment sizing and budget costs for the system.

5.2.2 Critical-fluid Extraction

Objectives

The goal of testing critical-fluid extraction for prospective use at the SCP/Carlstadt site is to determine solvent extraction efficiency for the organic compounds present in the ground water.

Process Description

Critical fluids are condensed gases and supercritical fluids such as carbon dioxide, freon, and propane, in the vicinity of their critical points. Above or near the critical point, the transition from gas to liquid is continuous, rather than abrupt. Under such conditions, fluids have very favorable solvent properties. They behave like liquids in that they are capable of dissolving significant amounts of oil or other substances and like gases in that the rates of extraction are much higher than those of liquid solvents.

The process of critical-fluid extraction involves solvent extraction of the ground water constituents and subsequent separation of the solvent and organics, with reuse of the solvent. A liquid feed such as ground water enters near the top of an extractor. The solvent is fed countercurrently into the bottom. At or near the gas's critical point (usually ambient temperature and several hundred psi), the organics in the ground water dissolve into the solvent. Organic-laden extract is removed from the top of the column, while clean water leaves through the bottom. The extract then goes to a separator, where the temperature and pressure are decreased, causing the organics to separate from the solvent. Clean solvent is recycled to the

extractor, and concentrated organics are recovered from the bottom of the separator.

Examples of organic compounds that can be extracted economically from ground water using the critical-fluid system include chlorinated hydrocarbons, phenols, benzene and benzene derivatives, alcohols, ketones, acids, oils and greases. The technology is economically cost-competitive at organics levels up to 30 percent. Metals are not removed by this process.

Treatability Study Procedures

Approximately two gallons of ground water collected will be extracted by CF Systems Corporation, Waltham, Massachusetts, in a proprietary laboratory-scale unit. The solvent used will be liquefied carbon dioxide. The solution remaining following extraction and the treated ground water will be analyzed for organics as described in the following section.

Test Data Evaluation

Results of the analytical testing will be submitted to CF Systems to enable its staff to develop full-scale system sizing and cost information.

5.2.3 UV/Peroxidation

Objectives

The goal of treatability studies involving UV/peroxidation is to evaluate the degree of organics degradation possible via the process, and the reagent dosages and contact time needed to do so.

Process Description

UV/peroxidation is an enhanced form of chemical oxidation that uses a conventional oxidant, hydrogen peroxide, and catalyzes its reaction with organics using high-intensity ultraviolet light. The catalysis results in more efficient generation of hydroxyl radicals from the peroxide. These hydroxyl radicals attack double bonds and, to a lesser extent, saturated bonds in the organic molecules to be degraded. In practice, the ground water undergoes peroxide addition and then flows through a reactor of proprietary configuration where it is irradiated with UV light. The organics generally undergo complete mineralization, yielding carbon dioxide and water. If chlorinated compounds are being oxidized, an inorganic chloride is produced in the reaction. The process is most effective on unsaturated compounds such as trichloroethylene and aromatics. However, the removal of slightly slower-degrading substances such as chloroform is economically practical when smaller flows such as those projected for the SCP/Carlstadt site are to be treated. Among the ten main organic compounds present in site ground water, general data on treatment efficacy by this method are lacking only for nitrobenzene. Metals are not removed by this process.

Treatability Study Procedures

A ten-gallon sample of ground water collected will be submitted to Peroxidation Systems, Inc. (PSI), Tucson, Arizona, for treatment in a proprietary bench-scale UV/peroxidation unit. Testing will be conducted under at least three sets of conditions, varying peroxide dosage, UV intensity, and residence time. Samples of the influent and final effluents will be taken for the analyses described in Section 5.2 below. In addition, samples will be collected at three intervals during each test run. Control samples will also be collected (to evaluate volatilization losses) from ground water subjected to the test

conditions, except that no treatment will be performed on the control sample.

Test Data Evaluation

The results of the testing program will be provided to PSI for its use in developing system sizing and cost estimates for a full-scale system.

5.2.4 Granular Activated Carbon

Objectives

The purpose for performing tests using Granular Activated Carbon (GAC) is to evaluate the carbon doses required and removal efficiencies for the different compounds present in the site's shallow ground water.

Process Description

Carbon adsorption involves contacting a waste stream with carbon, usually by flow through a series of packed bed reactors. Molecular adsorption onto GAC occurs through physical and/or chemical forces in which molecules are held on the surfaces of the carbon particles. Activated carbon's favorable adsorptive properties are related to its high available surface area. Constituents are removed from the waste stream and adsorbed from the liquid phase onto and into the solid carbon phase pore structure. Larger more highly branched and less soluble compounds are more readily adsorbed. The degree to which carbon adsorption can be used to remove contaminants from a waste stream is dependent on the specific compounds to be removed, concentrations of other organics in the stream, and the choice of carbon material. Polar compounds, such as ketones, alcohols and small nonpolar molecules like vinyl chloride are not well

adsorbed. Metals may be adsorbed by GAC, depending on their ionic form and solution characteristics.

Once the micropore surfaces of the GAC are saturated with organics, the carbon is "spent" and must be either replaced with virgin carbon or removed, regenerated, and replaced. Carbon "breakthrough" refers to the condition in which a specified effluent concentration limit is exceeded. Complete exhaustion of a bed occurs when the carbon is completely spent (no further adsorption of the contaminant(s) can occur). The operation time available before reaching breakthrough is the single most critical operating parameter in carbon system design.

Treatability Study Procedures

Treatability work on activated carbon will be conducted by Calgon Carbon Corporation via accelerated column testing (ACT). The project time frame does not allow full column studies to be performed. The ACT consists of a single-column continuous-flow study. Fifteen gallons of site ground water will be fed to the one half-inch diameter column at an accelerated rate, and influent and effluent samples will be taken at intervals over time. These samples will be analyzed by Calgon and, for selected samples, by Lancaster Laboratory for certain TCL list compounds including metals. Specifically, full TCL scans of the influent at the beginning and end of the ACT study and for one effluent sample will be run by Lancater Laboratory. Intermediate analyses shall be performed by Calgon, as only in this way can sufficiently short sample turnaround times be achieved.

Test Data Evaluation

Results of the analyses are used to plot breakthrough curves for the various compounds in the feed to determine the time to breakthrough and exhaustion for each constituent of concern. Results of this analysis will be used by Calgon to estimate

column performance and carbon changeout rates for the full-scale system. These data will then be used to develop costs for the full-scale adsorption system.

5.3 Sample Collection and Analytical Methods

To conduct the treatability work described above, approximately 30 gallons of ground water will be collected. The majority of ground water will be sent to the various vendors as detailed in Tables 5-2 and 6-1. Part of the collected ground water will be analyzed for iron, TSS, TDS, alkalinity, hardness, TOC, BOD, COD, chloride, and sulfate. Dissolved oxygen and pH will be determined in the field at the time of sampling. All ground water samples will be collected from well locations 3S and 7S to obtain a worst-case concentration and constituent range. To minimize volatilization of lighter organics during sample collection, samples will be taken from each well with a minimum of turbulence, and all bottles will be filled to zero headspace. Amber bottles or metal containers will be used for ground water collection and transport to prevent photodegradation of certain of the components in the water. Ground water will be chilled to 4°C during transport to reduce biological activity in the system. The size of sample container used will be the largest possible within the transport constraints set by regulation (i.e., that volume not requiring manifesting). Vendors performing the treatability work will be advised to keep the ground water containers closed and cold until the time of testing to maintain sample quality. As a precaution, however, influent ground water will be analyzed immediately prior to testing to avoid false observed treatment efficiencies due to natural degradation processes during the period between ground water collection and treatability testing.

System effluent samples will be taken throughout ACT testing, at intervals during UV/peroxidation testing, and at the conclusion

of the steam stripping and critical-fluid extraction tests. Samples will be collected and transported as follows. Volatile organic samples will be collected in 40 ml teflon-septum VOA vials and preserved with hydrochloric acid. Semivolatile compound samples will be collected unpreserved in one-liter amber bottles. Pesticide and PCB samples will be collected unpreserved in one-liter glass bottles. Metal samples will be collected in one-liter polyethylene bottles and preserved with nitric acid. Because of the wide variety of organics present in the ground water, all samples will undergo a full TCL (HSL) scan using Method No. CLP 7/87 excluding metals, except for the GAC ACT samples, which will include metals analysis. Except for the analyses performed by Calgon Carbon Corporation, all analyses will be performed by a CLP - certified laboratory (Lancaster Laboratory).

SECTION 6

SUMMARY OF CHEMICAL ANALYSES

6.1 Treatability Study Analysis

A summary of chemical analytical work for the stabilization/solidification, thermal treatment, contaminant extraction, and ground water treatment Treatability Studies is included for reference.

Table 6-1 summarizes the raw sample analyses, and Table 6-2 summarizes the treated sample analyses.

TABLE 6-1
Treatability Study Raw Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Holding Times	Method of Analysis
(Raw Characterization Soils/Sludges)	Grab from B-1	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Grab from B-2	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Grab from B-3	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Grab from B-4	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010

TABLE 6-1 (Continued)
Treatability Study Raw Sample Chemical Analyses

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Times	Method of Analysis
	Grab from B-5	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Grab from P-2	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Grab from P-3	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Grab from P-4	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010

TABLE 6-1 (Continued)
Treatability Study Raw Sample Chemical Analyses

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Times	Method of Analysis
	Grab from MW-5d	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Grab from MW-3S	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
(Raw Characterization soils/sludges con't)	Grab from MW-6S	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Duplicate grab from B-5	(1) 2-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc	(A)	6 months; Hg - 28 days	EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Trip blank (sand)	(1) 1-liter clear glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(A)	10 days	TCL VOCs, Per EPA CLP protocol

TABLE 6-1 (Continued)
Treatability Study Raw Sample Chemical Analyses

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Times	Method of Analysis
Stabilization/ Solidification Treatability Study	Soil Hot Spot-Lead	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1)12oz wide mouth bottle	4 degrees C	Hazcon, Inc	(A)	6 months	Lead Analysis, per EPA CLP Protocol
	Soil Hot Spot-Lead	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	Enreco Labs.	(A)	6 months	Lead Analysis, per EPA CLP Protocol
	Soil Hot Spot-VOCs	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1)12oz wide mouth bottle	4 degrees C	Hazcon, Inc	(A)	10 days	Proposed Toxicity Characteristic Contaminants Analysis,(VOCs only) in FR 21648 6/13/86 Per EPA CLP Protocol
	Soil Hot Spot-VOCs	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	Enreco Labs.	(A)	10 days	Proposed Toxicity Characteristic Contaminants Analysis,(VOCs only) in FR 21648 6/13/86 Per EPA CLP Protocol
	Hot Spot Soil Composite	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1)12oz wide mouth bottle	4 degrees C	Hazcon, Inc	(A)	10 days (VOCs), 7 days until extraction, analysis within 40 days of extract preparation (B/Ns, A/Es, Pesticides) Metals - 6 mo.; Hg - 28 days	Proposed Toxicity Characteristic Contaminants FR 21648 6/13/86 Per EPA CLP Protocol
	Hot Spot Soil Composite	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	Enreco Labs.	(A)	10 days (VOCs), 7 days until extraction, analysis within 40 days of extract preparation Metals - 6 mo.; Hg - 28 days	Proposed Toxicity Characteristic Contaminants FR 21648 6/13/86 Per EPA CLP Protocol

TABLE 6-1 (Continued)
Treatability Study Raw Sample Chemical Analyses

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Times	Method of Analysis
Stabilization/ Solidification Treatability Study (continued)	Overall Soil Composite	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1)12oz wide mouth bottle	4 degrees C	Hazcon, Inc	(A)	10 days (VOCs), 7 days until extraction, analysis within 40 days of extract preparation (B/Ns, A/Es, Pesticides) Metals - 6 mo.; Hg - 28 days	Proposed Toxicity Characteristic Contaminants FR 21648 6/13/86 Per EPA CLP Protocol
	Overall Soil Composite	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	Enreco Labs.	(A)	10 days (VOCs), 7 days until extraction, analysis within 40 days of extract preparation (B/Ns, A/Es, Pesticides) Metals - 6 mo.; Hg - 28 days	Proposed Toxicity Characteristic Contaminants FR 21648 6/13/86 Per EPA CLP Protocol
	Sludge Hot Spot-B/N	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1)12oz wide mouth bottle	4 degrees C	Hazcon, Inc	(A)	7 days until extraction analysis within 40 days of extract preparation	TCL B/Ns, Per EPA CLP Protocol
	Sludge Hot Spot-B/N	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	Enreco Labs.	(A)	7 days until extraction analysis within 40 days of extract preparation	TCL B/Ns, Per EPA CLP Protocol
	Sludge Tank and Pit Composite	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1)12oz wide mouth bottle	4 degrees C	Hazcon, Inc	(A)	7 days until extraction analysis within 40 days of extract preparation for PCBs Metals - 6 mo.; Hg - 28 days	TAL Metals and TCL PCBs Analysis Per EPA CLP Protocol
	Sludge Tank and Pit Composite	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	Enreco Labs.	(A)	7 days until extraction analysis within 40 days of extract preparation for PCBs Metals - 6 mo.; Hg - 28 days	TAL Metals and TCL PCBs Analysis Per EPA CLP Protocol

TABLE 6-1 (Continued)
Treatability Study Raw Sample Chemical Analyses

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Times	Method of Analysis
Contaminant Extraction Treatability Study	Soil Hot Spot-Lead	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 32-oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc.	(B)	6 months	Lead Analysis, Per EPA CLP Protocol
	Soil Hot Spot-PCBs	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 32-oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc.	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL PCBs analysis, Per EPA CLP Protocol
	Soil Hot Spot Composite	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 4-oz wide mouth jar	4 degrees C Zero headspace Teflon-lined lid	ERM, Inc.	(B)	10 days	TCL Volatiles Per EPA CLP Protocol TPH(Total Petroleum Hydrocarbons)EPA 418.1
		(1) 32-oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc.	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL B/Ns, A/Es, PCBs Per EPA CLP Protocol
	Overall Soil Composite	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 4-oz wide mouth jar	4 degrees C Zero headspace Teflon-lined lid	ERM, Inc.	(B)	10 days	TCL Volatiles Per EPA CLP Protocol TPH(Total Petroleum Hydrocarbons)EPA 418.1
		(1) 32-oz wide mouth jar	4 degrees C Teflon-lined lid			7 days until extraction analysis within 40 days of extract preparation	TCL B/Ns, A/Es, PCBs Per EPA CLP Protocol
	Sludge Hot Spot-B/N	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 32-oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc.	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL B/Ns Analysis, Per EPA CLP Protocol

TABLE 6-1 (Continued)
Treatability Study Raw Sample Chemical Analyses

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Times	Method of Analysis
Contaminant Extraction Treatability Study (Continued)	Sludge Tank/Pit Composite	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) 4-oz wide mouth jar	4 degrees C Zero headspace Teflon-lined lid	ERM, Inc.	(B)	10 days - VOA TPH - 28 days	TCL Volatiles Per EPA CLP Protocol TPH(Total Petroleum Hydrocarbons)EPA 418.1
	(Raw Sample Portion)	(1) 32-oz wide mouth jar	4 degrees C Teflon-lined lid			7 days until extraction analysis within 40 days of extract preparation	TCL B/Ns, A/Es, PCBs Per EPA CLP Protocol
Thermal Treatment Treatability Study	Soil Hot Spot-Metals	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) DI/Methanol rinsed clear glass bottle	Teflon-lined lid Dry ice	EER, Inc.	(A) (C)	7 days until extraction analysis within 40 days of extract preparation (PCBs) 6 mos. (metals); Hg - 28 days	TAL Metals, per EPA CLP Protocol PCB Organics - EPA CLP Protocol Elemental C,H,N,S,Cl (ultimate analysis) EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Sludge Tank/Pit Composite	(3) 5-gal container with triple plastic liner (inner polyethylene)	4 degrees C	ERM, Inc to			
	(Raw Sample Portion)	(1) DI/Methanol rinsed clear glass bottle	Teflon-lined lid Dry ice	EER, Inc.	(A) (C)	7 days until extraction analysis within 40 days of extract preparation (PCBs) 6 mos. (metals); Hg - 28 days	TAL Metals, per EPA CLP Protocol PCB Organics - EPA CLP Protocol Elemental C,H,N,S,Cl (ultimate analysis) EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010

TABLE 6-1 (Continued)
Treatability Study Raw Sample Chemical Analyses

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Times	Method of Analysis
(Raw Characterization Ground Water)	Composite from MW-3S and MW-7S	(1) 1-liter clear glass bottle	4 degrees C, HNO3 addition Teflon-lined lid	ERM, Inc	(A)	6 months	Iron unfiltered, per EPA CLP Protocol, hardness
	Composite from MW-3S and MW-7S	(1) 4-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(A)	48 hrs (BOD) 7 days (TDS, TSS) 48 hrs (alkalinity) 28 days (chlorides,sulfate)	BOD5, EPA 405.1 TDS, EPA 160.1 TSS, EPA 160.2 Chloride, EPA 325.3 Alkalinity, EPA 310.1 Sulfate EPA 375.4
	Composite from MW-3S and MW-7S (Duplicate)	(1) 4-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(A)	48 hrs (BOD) 7 days (TDS, TSS) 48 hrs (alkalinity) 28 days (chlorides,sulfate)	BOD5, EPA 405.1 TDS, EPA 160.1 TSS, EPA 160.2 Chloride, EPA 325.3 Alkalinity, EPA 310.1 Sulfate, EPA 375.4
	Composite from MW-3S and MW-7S	(1) 500-ml clear glass bottle	4 degrees C, H3PO4 addition Teflon-lined lid	ERM, Inc	(A)	28 Days	COD, EPA 410.1 TOC, EPA 415.2
	Trip Blank (DI Water)	(1) 4-liter amber glass bottle	4 degrees C Teflon-lined lid Zero headspace	ERM, Inc	(A)	7 days	TCL VOCs per EPA CLP Protocol
GAC Treatability	Composite from MW-3S and MW-7S	(2) 5-gal plastic carboys (1) 5-gal steel gas can	4 degrees C	ERM, Inc to			
	(Influent)	(2)40-ml screw-cap teflon-lined vial	Zero headspace HCl Addition 4 degrees C	Calgon	(B)	14 days	TCL Volatiles per EPA CLP Protocol
		(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Calgon	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL B/Ns, A/Es per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Calgon	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL Pesticides, PCBs per EPA CLP Protocol
		(1)1-liter polyethylene bottle	HNO3 Addition	Calgon	(B)	6 months; Hg - 28 days	Target Analyte List (TAL) Metals per EPA CLP Protocol

TABLE 6-1 (Continued)
Treatability Study Raw Sample Chemical Analyses

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Times	Method of Analysis
UV/Peroxidation Treatability	Composite from MW-3S and MW-7S	(2) 5-gal steel gas cans	4 degrees C	ERM, Inc to			
	(Raw Feed)	(2)40-ml screw-cap teflon-lined vial	Zero headspace HCl Addition 4 degrees C	Peroxidation Sytems	(B)	14 days	TCL Volatiles and TICs per EPA CLP Protocol
		(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Peroxidation Sytems	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL B/Ns, A/Es and TICs per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Peroxidation Sytems	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL Pesticides, PCBs per EPA CLP Protocol
Steam Stripping Treatability	Composite from MW-3S and MW-7S	(3) 4-liter amber bottles*	4 degrees C Teflon-lined lid	ERM, Inc to			
	(Influent)	(2)40-ml screw-cap teflon-lined vial	Zero headspace HCl Addition 4 degrees C	APV Crepaco	(B)	14 days	TCL Volatiles per EPA CLP Protocol
		(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	APV Crepaco	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL B/Ns, A/Es per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	APV Crepaco	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL Pesticides, PCBs; per EPA CLP Protocol
		*Larger quantity shipped than proposed in sampling plan, per vendor's request					
Critical Fluid Extracton Treatability	Composite from MW-3S and MW-7S	(2) 4-liter amber bottles	4 degrees C Teflon-lined lid	ERM, Inc to			
	(Influent)	(2)40-ml screw-cap teflon-lined vial	Zero headspace HCl Addition 4 degrees C	CF Systems	(B)	14 days	TCL Volatiles per EPA CLP Protocol
		(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	CF Systems	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL B/Ns, A/Es per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	CF Systems	(B)	7 days until extraction analysis within 40 days of extract preparation	TCL Pesticides, PCBs per EPA CLP Protocol

TABLE 6-1 (Continued)
Treatability Study Raw Sample Chemical Analyses

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Times	Method of Analysis

CLP Laboratories:

(A) Compuchem Laboratories
Research Triangle Park, NC
Organics: SOW 10/86, with revisions through 7/87
Inorganics: SOW 7/87

(B) Lancaster Laboratories
Lancaster, PA
Organics: SOW 10/86, with revisions through 7/87
Inorganics: SOW 7/87

(C) Northeastern Analytical Corporation
Medford, NJ
Non protocol ultimate analyses

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
SOILS/SLUDGES							
Stabilization/Solidification Round 3	Hot Spot Soil Composite (with Ground Water) Design Mix Plug	(1) Wide mouth jar	4 degees C Teflon-lined lid	Enreco Laboratories	(A)	10 days(VOC);7 days until extraction, analysis within 40 days of extract prep(B/Ns, A/Es,Pests.); 6 mos (Metals); Hg-28 days	TCLP Leachate Development,with Complete Analysis of Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86
	Soil Hot Spot-Lead Design Mix Plug	(1) Wide mouth jar	4 degees C Teflon-lined lid	Enreco Laboratories	(A)	6 months	TCLP on 14-day Cured Plug, Lead Analysis SW-846, Method 7421
	Soil Hot Spot-VOCs Design Mix Plug	(1) Wide mouth jar	4 degees C Teflon-lined lid	Enreco Laboratories	(A)	10 days	TCLP on 14-day Cured Plug, Partial Analysis of Proposed Toxicity Characteristic Contaminants (VOCs only) FR 21648 6/13/86 SW-846, Method 8240
	Hot Spot Soil Composite Design Mix Plug	(1) Wide mouth jar	4 degees C Teflon-lined lid	Enreco Laboratories	(A)	10 days(VOC);7 days until extraction, analysis within 40 days of extract prep(B/Ns, A/Es,Pests.); 6 mos (Metals); Hg-28 days	TCLP on 3-day Cured Plug, Complete Analysis of Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86
	Overall Soil Composite Design Mix Plug	(1) Wide mouth jar	4 degees C Teflon-lined lid	Enreco Laboratories	(A)	10 days(VOC);7 days until extraction, analysis within 40 days of extract prep(B/Ns, A/Es,Pests.); 6 mos (Metals); Hg-28 days	TCLP on 14-day Cured Plug, Complete Analysis of Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86
	Sludge Hot Spot-B/N Design Mix Plug	(1) Wide mouth jar	4 degees C Teflon-lined lid	Enreco Laboratories	(A)	7 day until extraction, analysis within 40 days of extract preparation	TCLP on 14-day Cured Plug, B/Ns Analysis of Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86 B/Ns, A/Es only SW-846, Method 8270
	Sludge Tank and Pit Composite Design Mix Plug	(1) Wide mouth jar	4 degees C Teflon-lined lid	Enreco Laboratories	(A)	7 day until extraction, analysis w/i 40 days of extract prep (PCBs); 6 mos. (metals) Hg-28 days	TCLP on 14-day Cured Plug, Metals Analysis of Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86, and PCBs analysis SW-846, Methods 6010,8080
	Hot Spot Soil Composite Design Mix Plug	(1) Wide mouth jar	4 degees C Teflon-lined lid	Enreco Laboratories	(A)	10 days(VOC);7 days until extraction, analysis within 40 days of extract prep(B/Ns, A/Es,Pests.); 6 mos. (metals) Hg-28 days	Multiple Extraction Procedure on 14-day cured plug, Complete Analysis of Proposed Toxicity Characteristic Contaminants FR 21648 6/13/86
	Hot Spot Soil Composite (with Ground Water) Design Mix Plug	Polypropylene cylindrical mold	---	Hazcon, Inc	(A)	10 days(VOC);7 days until extraction, analysis within 40 days of extract prep(B/Ns, A/Es,Pests.); 6 mos (Metals); Hg-28 days	TCLP Leachate Development,with Complete Analysis of Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86
	Soil Hot Spot-Lead Design Mix Plug	Polypropylene cylindrical mold	---	Hazcon, Inc	(A)	6 months	TCLP on 14-day Cured Plug, Lead Analysis only SW-846, Method 7421

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
Stabilization/Solidification Round 3 (con't)	Soil Hot Spot-VOCs Design Mix Plug	Polypropylene cylindrical mold	---	Hazcon, Inc	(A)	10 days	TCLP on 14-day Cured Plug, Partial Analysis of Proposed Toxicity Characteristic Contaminants (VOCs only) FR 21648 6/13/86 SW-846, Method 8240
	Hot Spot Soil Composite Design Mix Plug	Polypropylene cylindrical mold	---	Hazcon, Inc	(A)	10 days(VOC);7 days until extraction, analysis within 40 days of extract prep(B/Ns, A/Es,Pests.); 6 mos (Metals); Hg-28 days	TCLP on 3-day Cured Plug, Complete Analysis of Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86
	Overall Soil Composite Design Mix Plug	Polypropylene cylindrical mold	---	Hazcon, Inc	(A)	10 days(VOC);7 days until extraction, analysis within 40 days of extract prep(B/Ns, A/Es,Pests.); 6 mos (Metals); Hg-28 days	TCLP on 14-day Cured Plug, Complete Analysis of Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86
	Sludge Hot Spot-B/N Design Mix Plug	Polypropylene cylindrical mold	---	Hazcon, Inc	(A)	7 day until extraction, analysis within 40 days of extract preparation	TCLP on 14-day Cured Plug, B/Ns Analysis of Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86 (BNs, AEs only)SW-846, Method 8270
	Sludge Tank and Pit Composite Design Mix Plug	Polypropylene cylindrical mold	---	Hazcon, Inc	(A)	7 day until extraction, analysis within 40 days of extract prep (PCBs); 6 mos (Metals); Hg-28 days	TCLP on 14-day Cured Plug, Metals Analysis of Proposed Toxicity Characteristic Contaminants, FR 21648 6/13/86, and PCBs analysis
	Hot Spot Soil Composite Design Mix Plug	Polypropylene cylindrical mold	---	Hazcon, Inc	(A)	10 days(VOC);7 days until extraction, analysis within 40 days of extract prep(B/Ns, A/Es,Pests.); 6 mos (Metals); Hg-28 days	Multiple Extraction Procedure on 14-day cured plug EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
Contaminant Extraction Treatability after HCl	**Treated Solids:**						
	Soil Hot Spot-Lead	(1) 32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	6 months	Lead,Per EPA CLP Protocol
	Soil Hot Spot Composite	(1) 32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
	Overall Soil Composite	(1) 32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
	Sludge Tank and Pit Composite	(1) 32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
Contaminant Extraction Treatability after HCl (Continued)	**Spent Extraction Fluids Generated During Treatment of:**						
	Soil Hot Spot-Lead	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead,Per EPA CLP Protocol
	Soil Hot Spot Composite	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
	Overall Soil Composite	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
	Sludge Tank and Pit Composite	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
	Neutralizing Solutions Generated During Treatment of:						
	Soil Hot Spot-Lead	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead,Per EPA CLP Protocol
	Soil Hot Spot Composite	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
	Overall Soil Composite	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
	Sludge Tank and Pit Composite	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
	Wash Waters Generated During Treatment of:						
	Soil Hot Spot-Lead	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead,Per EPA CLP Protocol
	Soil Hot Spot Composite	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
	Overall Soil Composite	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
	Sludge Tank and Pit Composite	(1)1-liter polyethylene bottle	HNO3 Addition	ERM, Inc.	(B)	6 months	Lead, Copper, Total Chromium;Per EPA CLP Protocol
Contaminant Extraction Treatability after surfactant	**Treated Solids:**						
	Soil Hot Spot-PCBs	(1) 32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	Total PCBs, Per EPA CLP Protocol
	Soil Hot Spot Composite	(1)4oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	10 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(1)32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es,PCBs, Pesticides; Per EPA CLP Protocol

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
	Overall Soil Composite	(1)4oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	10 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(1)32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es,PCBs, Pesticides; Per EPA CLP Protocol
Contaminant Extraction Treatability after surfactant (Continued)	Sludge Tank and Pit Composite	(1)4oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	10 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(1)32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es,PCBs, Pesticides; Per EPA CLP Protocol
	Spent Extraction Fluids Generated During Treatment of:						
	Soil Hot Spot-PCBs	(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	Total PCBs, Per EPA CLP Protocol
	Soil Hot Spot Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs, Per EPA CLP Protocol
	Overall Soil Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1) 1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs, Per EPA CLP Protocol
	Spent Extraction Fluids Generated During Treatment of:						
	Sludge Tank and Pit Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs, Per EPA CLP Protocol

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
	Wash Waters Generated During Treatment of: Soil Hot Spot-PCBs	(1)1-liter amber glass bottle	4 degrees C	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	Total PCBs, Per EPA CLP Protocol
Contaminant Extraction Treatability after surfactant (con't)	Soil Hot Spot Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs, Per EPA CLP Protocol
	Overall Soil Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation *Allowable*	TCL Pesticides, PCBs, Per EPA CLP Protocol
	Sludge Tank and Pit Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs, Per EPA CLP Protocol
Contaminant Extraction Treatability after CITRIKLEEN (5% and 10%, separate trials)	**Treated Solids:** Soil Hot Spot-PCBs	(1) 32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	Total PCBs, Per EPA CLP Protocol

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
Contaminant Extraction Treatability after CITRIKLEEN (5% and 10%, separate trials)	Overall Soil Composite	(1)4oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	10 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(1)32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es,PCBs,Pesticides; Per EPA CLP Protocol
	Sludge Hot Spot B/Ns	(1)32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns Per EPA CLP Protocol
	Sludge Tank and Pit Composite	(1)4oz wide mouth jar	zero headspace 4 degrees C Teflon-lined lid	ERM, Inc	(B)	10 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(1)32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es,PCBs,Pesticides; Per EPA CLP Protocol
	Spent Extraction Fluids Generated During Treatment of:						
	Soil Hot Spot-PCBs	(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	Total PCBs, Per EPA CLP Protocol
	Overall Soil Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides,PCBs, Per EPA CLP Protocol
	Sludge Hot Spot B/Ns	(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns Per EPA CLP Protocol
	Spent Extraction Fluids Generated During Treatment of:						
	Sludge Tank and Pit Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
Contaminant Extraction Treatability after CITRIKLEEN (5% and 10%, separate trials)	**Spent Extraction Fluids Generated During Treatment of:**						
	Sludge Tank and Pit Composite	(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides,PCBs, Per EPA CLP Protocol
	Wash Waters Generated During Treatment of:						
	Soil Hot Spot-PCBs	(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	Total PCBs, Per EPA CLP Protocol
	Overall Soil Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
	Overall Soil Composite (Cont.)	(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides,PCBs, Per EPA CLP Protocol
	Sludge Hot Spot B/Ns	(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns Per EPA CLP Protocol
	Sludge Tank and Pit Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides,PCBs, Per EPA CLP Protocol
Contaminant Extraction Treatability after sequential trials with three extraction fluids: a)5% aq. surfactant b)10% HCl c)10% CITRIKLEEN	**Treated Solids:**						
	Soil Hot Spot Composite	(1)4oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	10 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(1)32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es,PCBs, Pesticides; Per EPA CLP Protocol
	Overall Soil Composite	(1)4oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	10 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
Contaminant Extraction Treatability after sequential trials with three extraction fluids: a)5% aq. surfactant b)10% HCl c)10% CITRIKLEEN	**Treated Solids:** Overall Soil Composite	(1)32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es,PCBs, Pesticides; Per EPA CLP Protocol
	Sludge Tank and Pit Composite	(1)4oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	10 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(1)32oz wide mouth jar	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es,PCBs; Per EPA CLP Protocol
	Spent Extraction Fluids Generated During Treatment of: Soil Hot Spot Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs Per EPA CLP Ptotocol
	Overall Soil Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs Per EPA CLP Ptotocol
	Spent Extraction Fluids Generated During Treatment of: Sludge Tank and Pit Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs Per EPA CLP Ptotocol

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
Contaminant Extraction Treatability after sequential trials with three extraction fluids: a)5% aq. surfactant b)10% HCl c)10% CITRIKLEEN	**Wash Waters Generated During Treatment of:** Soil Hot Spot Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs Per EPA CLP Ptotocol
	Overall Soil Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
	Overall Soil Composite	(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs Per EPA CLP Ptotocol
	Sludge Tank and Pit Composite	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	ERM, Inc	(B)	14 days - VOA 28 days - TPH	TCL Volatiles Per EPA CLP Protocol and TPH (Total Petroleum Hydrocarbons) EPA 418.1
		(2)1-liter amber glass bottles	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns,A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	ERM, Inc	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs Per EPA CLP Ptotocol
Thermal Treatment	Ash from Hot Spot Soil Composite-Metals (6 samples)	(1) DI/Methanol rinsed clear glass bottle	4 degrees C Teflon-lined lid	EER	(A) (D)	10 days	TAL Metals, per EPA CLP Protocol PCB Organics - EPA CLP Protocol Elemental C,H,N,S,Cl (ultimate analysis) EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
Thermal Treatment	Ash from Sludge Tank and Pit Composite (6 samples)	(1) DI/Methanol rinsed clear glass bottle	4 degrees C Teflon-lined lid	EER	(A) (D)	10 days	TAL Metals, per EPA CLP Protocol PCB Organics - EPA CLP Protocol Elemental C,H,N,S,Cl (ultimate analysis) EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
	Flue gas (6 samples)	Modified Method 5 Sampling Train	---	EER	(C)	7 days	Particulate Metals (TCL); Total hydrocarbons; Total PCBs; HCl Per EPA CLP Protocol EP Tox metals (depends on sufficient particulate collected) EP Tox Metals Extraction SW 846-1310 Arsenic SW846-7060 Barium SW 846-6010 Cadmium SW 846-6010 Chromium SW 846-6010 Lead SW 846-7421 Mercury SW 846-7470 Selenium SW 846-7740 Silver SW 846-6010
GROUND WATER							
Steam Stripping Treatability	Effluent	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	APV Crepaco	(B)	14 days	TCL Volatiles,Per EPA CLP Protocol
		(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	APV Crepaco	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns, A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	APV Crepaco	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs;Per EPA CLP Protpcol
	Effluent	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	APV Crepaco	(B)	14 days	TCL Volatiles,Per EPA CLP Protocol

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
GROUND WATER *Ground Water* Steam Stripping Treatability (Continued)	Effluent	(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	APV Crepaco	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns, A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	APV Crepaco	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs;Per EPA CLP Protpcol
Critical-Fluid Extraction Treatability	Effluent	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	CF Systems	(B)	14 days	TCL Volatiles,Per EPA CLP Protocol
		(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	CF Systems	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns, A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	CF Systems	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs;Per EPA CLP Protpcol
UV/Peroxidation Treatability	12 Treatment Intermediates	**per intermediate:** (2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	Peroxidation Sys.	(B)	14 days	TCL Volatiles,Per EPA CLP Protocol
		(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Peroxidation Sys.	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns, A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Peroxidation Sys.	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs;Per EPA CLP Protpcol
	Optimal Trial Effluent	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	Peroxidation Sys.	(B)	14 days	TCL Volatiles and TICs,Per EPA CLP Protocol
		(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Peroxidation Sys.	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns, A/Es and TICs Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Peroxidation Sys.	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs;Per EPA CLP Protpcol
Granular Activated Carbon	Influent	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	Calgon Carbon Corp.	(B)	14 days	TCL Volatiles,Per EPA CLP Protocol

TABLE 6-2
Treatability Study Treated Sample Chemical Analyses

SCP/Carlstadt, New Jersey

Applicable Technology	Sample Type	Sample Container	Method of Preservation	Shipped By	To CLP Laboratory	Allowable Holding Time	Method of Analysis
GROUND WATER							
Granular Activated Carbon	Influent	(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Calgon Carbon Corp.	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns, A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Calgon Carbon Corp.	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs;Per EPA CLP Protpcol
		(1)1-liter polyethylene bottle	HNO3 addition	Calgon Carbon Corp.	(B)	6 months; Hg - 28 days	TAL Metals; Per EPA CLP Protocol
	Effluent	(2)40-ml screw-cap teflon-lined vials	zero headspace HCl addition 4 degrees C	Calgon Carbon Corp.	(B)	14 days	TCL Volatiles,Per EPA CLP Protocol
		(2)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Calgon Carbon Corp.	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL B/Ns, A/Es; Per EPA CLP Protocol
		(1)1-liter amber glass bottle	4 degrees C Teflon-lined lid	Calgon Carbon Corp.	(B)	7 day until extraction, analysis within 40 days of extract preparation	TCL Pesticides, PCBs;Per EPA CLP Protpcol
		(1)1-liter polyethylene bottle	HNO3 addition	Calgon Carbon Corp.	(B)	6 months; Hg - 28 days	TAL Metals; Per EPA CLP Protocol

(A) Compuchem Laboratories
Research Triangle Park, NC
Organics: SOW 10/86, with revisions through 7/87
Inorganics: SOW 7/87

(B) Lancaster Laboratories
Lancaster,PA
Organics: SOW 10/86, with revisions through 7/87
Inorganics: SOW 7/87

(C) ENSECO, Inc.
West Sacramento, California
Organics: SOW 288
Inorganics: SOW 7/87

(D) Northeastern Analytical Corporation
Medford, NJ
Non protocol ultimate analyses